McIDAS Users Group Meeting

University of Wisconsin-Madison
Space Science and Engineering Center

October 24-26, 1995

McIDAS Users Group Meeting

University of Wisconsin-Madison
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MUG Meeting Agenda

Wednesday, October 25th

- 1:00 P.M. Introduction and agenda review, *Denise Laitsch*
- 1:15 1994/5 in Review and Future Plans, *JT Young*
- 2:00 McIDAS in a Distributed Environment, *Joe Rueden*
- 2:30 Break
- 2:45 Abstract Data Distribution Environment (ADDE), *Tom Whittaker*
- 3:30 Future Technology for McIDAS, *Jean Stine*
- 4:00 McIDAS Applications Testing Process, *John Pyeatt*
- 4:15 Group photo
- 5:00 Poster session setup
- 5:30-8:00 Poster session and Ice Breaker

Thursday, October 26th

- 7:30 A.M. Continental breakfast
- 9:00 McIDAS Conventional Data Issues, *John Pyeatt*
- 9:15 MUG BBS and Other Internet Resources, *Tom Whittaker*
- 9:30 Vis5D Demonstration, *Bill Hibbard*
- 10:15 Break
- 10:30 Satellites and Ingestors, *Joe Rueden*
- 11:30 Lunch
- 1:00 P.M. NOAA's Satellite Programs for the 90s and Beyond, *Paul Menzel*
- 1:30 Break out groups for Program Managers, Developers, Operators, System Administrators, and Users
- 3:30 McIDAS Sunset Items, *Carl Norton*
- 3:45 MUG Business Affairs, *Bob Fox*
- 4:00 MUG meeting critique
- 5:00 Meeting ends

1994/5 in Review and Future Plans

J.T. Young

1994/5 in Review
and
Future Plans

J. T. Young
McIDAS Team Leader

1995 MUG Meeting

Notes

1994/5 in Review

- Distributed McIDAS
- Applications Program Interface (API)
- Abstract Data Distribution Environment (ADDE)
- MVS Functionality Port
- Data Acquisition
- Data Dissemination
- User Interface (UI)
- Reorganized MUG
- Value-Added Resellers

1994/5 in Review

Distributed McIDAS

- SSEC implementing prototype operational configuration
  - Only GVAR and Meteosat PDUS ingestors remain on mainframe
  - Applications continue to be ported
- The initial implementation will be complete before January 1, 1997
- Funding arrived slower than expected; used some MUG funds

1994/5 in Review

Applications Program Interface (API)

- Design work on basic concepts nearing completion
- Data access API
  - Detailed interface specifications are complete for image and gridded data
  - Now part of core McIDAS
- Argument-fetching API now part of core McIDAS

1994/5 in Review

Abstract Data Distribution Environment (ADDE)

- Developed ADDE servers for some non-McIDAS formats
- Released ADDE applicationsfor image data in June 1995
- Releasing ADDE applications for gridded data in next addendum
- Presented ADDE servers, image and gridded data in training

1994/5 in Review

MVS Functionality Port

- Ported primary mainframe functions to McIDAS-X
- Replacing mainframe versions of VAS, 3D and Windco with other approaches
  - Vis5D
  - NOAA/NESDIS developed automated subsystems

Notes

1994/5 in Review

Data Acquisition

- Supporting numerous post-launch changes to GVAR signal
- GVAR ingestor for mainframe is operational
- Worked on new ingestors for Unix
  - McIDAS-XCD was developed, tested and released
  - McIDAS-XSD now supports POES, DMSP flyover, GOES-7, GMS
- Hughes and SDS (Spain) are sources for SAS
- Data distribution by NWS continues to be problematic

1994/5 in Review

Data Dissemination

- Providing high interest databases on the Internet
  - Anonymous FTP, Gopher, WWW
  - Real-time images and movies
  - Sea surface temperature
- GOES Pathfinder
  - Processed a 19-month period (11 TBytes) of GOES-7 data into climate products in 3.5 months
  - Products available to Global Climate Change community

1994/5 in Review

Data Dissemination (continued)

- NOAA Geostationary Satellite Active Archive (GSAA)
  - Daily GOES browse
  - Global composite (GOES, GMS, Meteosat) 3 hourly
  - GOES forecast IR images (6 - 48 hour)
  - Archive retrieval

Notes

1994/5 in Review

User Interface (UI)

- OS/2
  - Developed new display using Presentation Manager (PM)
- Unix
  - Distributed Tcl/Tk-based Graphical User Interface (GUI) demo
  - Created McWeb (an Internet McIDAS-based client)

1994/5 in Review

Reorganized MUG

- Reorganized to reduce cost, increase efficiency
- Reorganized Publications staff as Center-wide resource
- Internet distribution of core McIDAS is now the preferred distribution method
- Implemented McIDAS-DOX MUG catagory; Two sites joined

1994/5 in Review

Value-Added Resellers

- Encouraged third party distribution of McIDAS or portions of it to
  - Broaden market into commercial arena
  - Expand research and development support base
  - Provide more options for current users
- Formed a working relationship with PRC
  - Currently implementing a system for TWC
  - Developing a migration plan for the USAF MIDDS

Notes

Future Plans

- ADDE
- MVS Functionality Port
- New Functions and Updates to Old
- Data Acquisition
- Data Dissemination
- User Interface
- MUG support changes
- Value added Resellers
- Freeware
- Long Range

Future Plans

ADDE

- Will develop additional data-access APIs
- Will introduce text and point source ADDE applications in May 1996
- Add error handling API in 1996
- Will develop additional ADDE servers for non-McIDAS formats

Future Plans

MVS Functionality Port

- New interactive Windco
- Sounder processing
- City and county databases
- Area statistics
- Virtual graphics
- Miscellaneous Meteorological Applications (i.e. HODO, Stability, SHEAR)

Notes

Future Plans

New Functions and Updates to Old

- New Functions
  - ADDE applications
  - McIDAS system management commands
  - Interactive Skew-T/Stuve diagram
  - Vis5D option with May 1996 upgrade
- Updates to Old
  - Some Unidata mods being retrofit into core McIDAS
  - New map databases
  - New weather symbols font
  - Enhanced set of primative grid operators
  - Improvements to some met. parameter algorithms

Future Plans

New Functions and Updates to Old

- New Functions
  - ADDE applications
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  - Improvements to some met. parameter algorithms

Future Plans

Data Dissemination

- Expand access to information via Internet
- Develop derived products for distribution
  - NDVI images
  - Derived geophysical parameters
- Distribute McWEB as internet interactive data access client
- Implement NOAA's Geostationary Satellite Archive System
  - More data near-line
  - Improved data request functionality

Notes

Future Plans

User Interface (UI)

- Continue primary focus on McIDAS-X UIs
- Goal is to make OS/2 and Unix UIs similar
- Will replace VGA version of McIDAS with PM version
- Considering ISO 8601 standard format for date and time
- Continue developing GUI using Tcl/Tk
- Will have a GUI interface as default interface after January 1, 1997

Future Plans

MUG Support Changes

- Provide addenda via Fastrack
- Pursue other methods to reduce costs

Future Plans

Value-Added Resellers

- SSEC's role with PRC customers
  - SSEC will have active science role with PRC customers
  - MUG members
    - PRC's "Help Desk" will provide first level support
    - SSEC's "Help Desk" will be available for referral
- Continue discussions with other resellers

Notes

Future Plans

Freeware

- Implemented a freeware version of McIDAS, called MERLIN
  - Different versions tailored to specific research communities, such as EOSDIS, AMRC, MODIS
  - Distribute object code only
  - Not MUG supported
- Will continue to expand on this concept

Future Plans

Long Range

- Return to emphasis on
  - Science functionality
  - Expanding the McIDAS tool kit
  - "Bleeding" edge technology
- Iterative development with user & developer teaming
- Reduce effort needed to support McIDAS
- Continue to reduce MUG expenses while providing better support for MUG members

Notes

McIDAS in a Distributed Environment

Joe Rueden

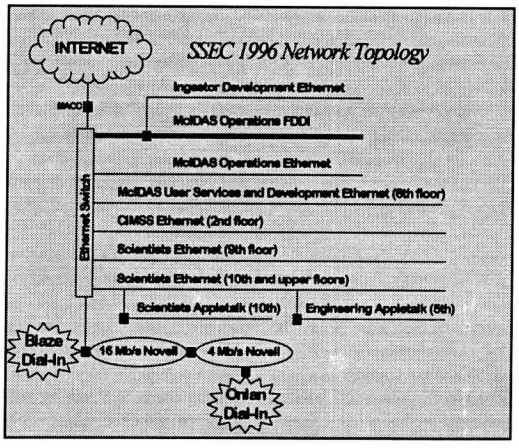
McIDAS in a Distributed Environment

Joe Rueden
McIDAS Team Leader

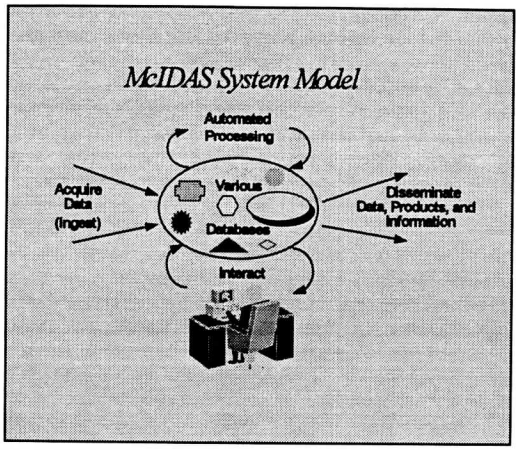
1995 MUG Meeting

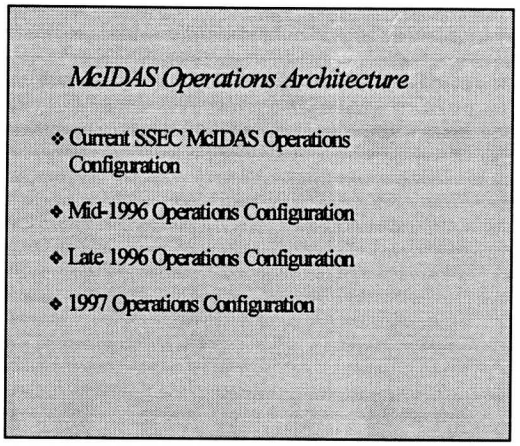
McIDAS in a Distributed Environment

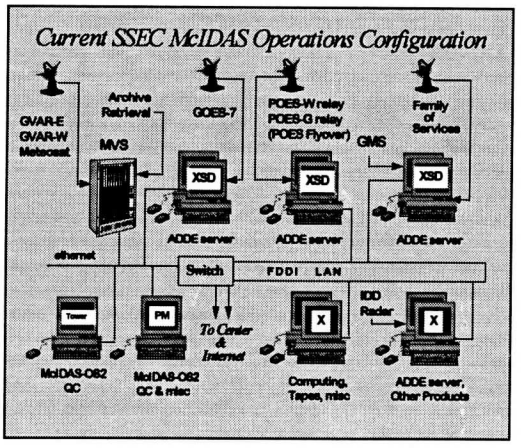
- SSEC 1996 Network Topology
- McIDAS System Model
- McIDAS Operations Architecture
- Lessons Learned



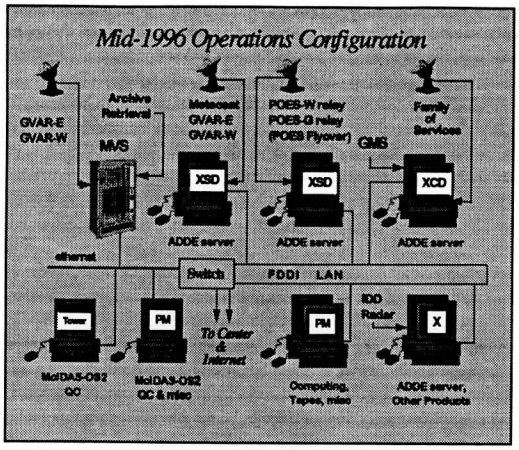
Notes


McIDAS System Model
Automated Processing
Acquire Data (Ingest)
Various
Databases
Disseminate Data, Products, and Information
Interact


McIDAS Operations Architecture
Current SSEC McIDAS Operations Configuration
Mid-1996 Operations Configuration
Late 1996 Operations Configuration
1997 Operations Configuration


Current SSEC McIDAS Operations Configuration
GVAR-E
GVAR-W
Metocast
Archive Retrieval
GOES-7
POES-W relay
POES-G relay
(POES Flyover)
Family of Services
GMS
MVS
XSD
XSD
XSD
ADDE server
ADDE server
ADDE server
ethernet
Switch
FDDI LAN
IDD Radar
Timer
PM
To Center & Internet
X
X
McIDAS-OS2 QC
McIDAS-OS2 QC & misc
Computing, Tapes, misc
ADDE server, Other Products

Notes


Mid-1996 Operations Configuration
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Family
of
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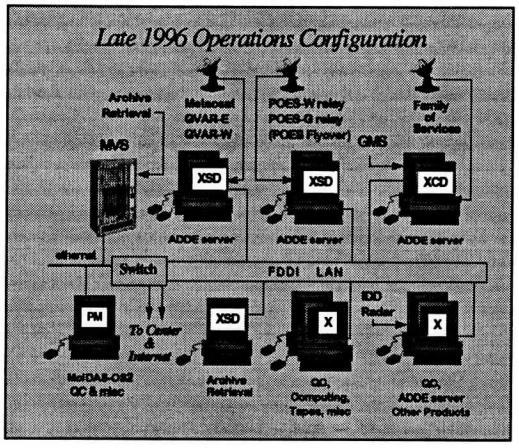
GMS
MVS
XSD
XSD
XCD
ADDE server
ADDE server
ADDE server
ethernet
Switch
FDDI LAN
Tower
PM
To Center
&
Internet
PM
IDD
Radar
X
McIDAS-OS2
QC
McIDAS-OS2
QC & misc
Computing,
Tapes, misc
ADDE server,
Other Products


Late 1996 Operations Configuration
Archive
Retrieval
Meteosat
GVAR-E
GVAR-W
POES-W relay
POES-G relay
(POES Flyover)
Family
of
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GMS
MVS
XSD
XSD
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ADDE server
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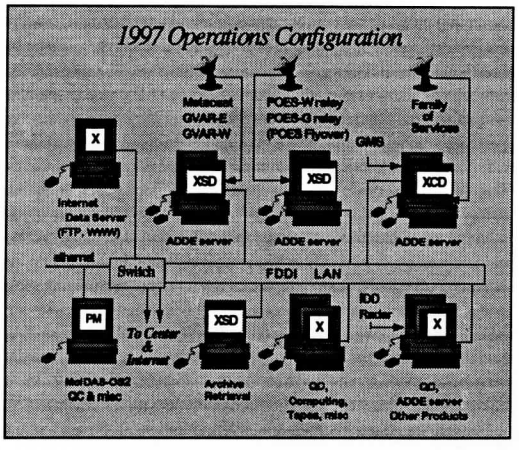
ethernet
Switch
FDDI LAN
PM
To Center
&
Internet
XSD
X
IDD
Radar
X
McIDAS-OS2
QC & misc
Archive
Retrieval
QC,
Computing,
Tapes, misc
QC,
ADDE server
Other Products


1997 Operations Configuration
X
Meteosat
GVAR-E
GVAR-W
POES-W relay
POES-G relay
(POES Flyover)
Family
of
Services
GMS
XSD
XSD
XCD
Internet
Data Server
(FTP, WWW)
ADDE server
ADDE server
ADDE server
ethernet
Switch
FDDI LAN
PM
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X
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McIDAS-OS2
QC & misc
Archive
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Tapes, misc
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Other Products

Notes

Lessons Learned

- Tape Issues
- Training and Staffing
- Hard Disk Backups
- Maintenance and Spares
- Shared Peripherals
- Security
- Accounting
- Costs
- Operations vs. Administration

Tape Issues

- Unix views tape as primarily for backup.
- We wrote AIX tape-access software for start-stop tapes, e.g., 6250 and 3480.
- Media are not equally reliable. For example:
  - 4mm (DAT or DDS) are fine for short term backups, but not for long term data storage.
  - 3480/3590 cartridges are fin for long term data storage, but are overkill for backups.

Training and Staffing

- McIDAS support staff is doubling.
- Training needs are more extensive than we expected.
- Systems administration and general Unix training need special focus.

Notes

Hard Disk Backups

- Biggest user of network bandwidth
- Networker and two HP 48 GB DAT (DDS-2) Autochangers work well; approximate University cost:
  - Hardware - $3,500
  - Software (server, 85 clients) - $16,000
  - Maintenance - $2,500/year plus tapes

Maintenance and Spares

- Our plan is tuned to the reliability needs of individual functions.
- Vendor maintenance is performed on machines with key functions.
- Hot spares are used for critical functions.
- Some units are easily reconfigured to spare other functions.

Security

- Architecture and administration must adapt to changing security constraints and concerns.
- We plan to make root access unnecessary for normal operations, such as:
  - Adding, modifying or deleting user accounts
  - Administering data space
  - Booting and shutting down machines
- Data security is handled via Unix read/write/execute access restrictions; administration is a major problem.

Notes

Security

- Trusted physical access simplifies security issues.
- Poor configurations lead to security holes.
- Good configuration policy is one component of a secure environment.
- More security options will be available in ADDE.

Accounting

- Unix does not support the project number concept.
- We are experimenting with Gejac's ARSAP accounting package.
- We use McIDAS Logs (statistics) as the basis for accounting from ADDE.
- We are creating an FTP daemon for accounting.

Operations vs. Administration

- Operations
  - Interfaces directly with the users
  - Monitors data acquisition and flows
  - Handles tapes
  - Deals operations-type problems occurring in production-level software

Notes

Operations vs. Administration

- Administration
  - Interfaces with Operations
  - Handles Operating Systems
  - Handles Unix-level system configuration
  - Handles common tools (such as compilers)
  - Solves problems below the Operations level

Notes

Abstract Data Distribution Environment (ADDE)

Tom Whittaker

Abstract Data Distribution Environment (ADDE)

Tom Whittaker
McIDAS Development Team Manager

1995 MUG Meeting

ADDE

- What Is ADDE?
- Why Are We Developing ADDE?
- What Does Core Currently Contain?
- New Utilities in Next Addendum
- Future Utilities
- The McIDAS "Reglue"

What is ADDE?

- Abstract—format of data on disk is transparent to applications
- Data—image, grids, point source, text, etc.
- Distribution—efficient transfer of data over local and wide area networks
- Environment—"*n. all conditions surrounding and affecting the development of...*"

Notes

Why Are We Developing ADDE?

- Easier data access on remote workstations
- Improved performance
- Better data management capabilities
- More data-handling flexibility
- Transparent use of non-McIDAS formats

What Does Core Currently Contain?

- New argument fetching routines
  - Better syntax error messages
  - Longer strings; can have more than 12 characters
  - Imbedded blanks in strings
  - Reduced number of application interfaces
  - Old interface problems removed

What Does Core Currently Contain? (continued)

- Five image utilities
  - IMGDISP — displays image data
  - IMGCOPY — copies or moves image data
  - IMGLIST — lists image directory
  - IMGPROBE — lists image data values
  - IMGDEL — deletes image data

Notes

Why Are We Developing ADDE?

Easier data access
- Cumbersome old numbering scheme for McIDAS format files
- NFS not always efficient enough
- Dataset names provide easy switch to backup

Improved performance
- MVS servers do not spool before transmission
- ADDE performs much better for Unix servers than NFS

Better data management capabilities
- Names are more intuitive and meaningful
- Named datasets and servers
- Platform changes transparent to user

More data-handling flexibility
- Three basic data types: image, grid, point source
- Practical to serve data from a grid to image application

Transparent use of non-McIDAS formats
- Client apps are file format independent
- Servers have knowledge of file formats
- Prototyped servers for SSM/I, Pathfinder, HDF, and Global Imaging (GI) satellite image data format
- Training exercise—server that reads grid point data from a text file and serves it as an image

New Utilities in Next Addendum

- Image
  - IMGOPER — performs basic image operations
- Grid
  - GRDDISP — displays grid point data
  - GRDCOPY — copies or moves grid data
  - GRDLIST — lists grid file information

Future Utilities

- Image (REMAP, etc.)
- Grid (derived parameters, etc.)
- Point source (display, move, list)
- Text (search, list)
- Navigation (ORBPLOT)
- Watch Box

The McIDAS "Reglue"

- Move low level code to C
- Create more common code between -X and -OS2
- Modify the implementation of User Common
- Rework the Image Window
- Rework the Text and Command Windows
- Run applications from the Unix shell

Notes

The McIDAS "Reglue

Move low level code to C
- Reduce infinities
- Increase standardization
- Change to 64 bit

Create more common code between -X and -OS2

Modify the implementation of User Common
- Available only as required
- Independent number of sessions
- "Terminal Number" concept being removed

Rework the Image Window
- "Shared memory display object
- Independent reading and writing
- More flexible coloring algorithms
- Multiple windows into frame objects
- Zoom, roam, resize window
- Increase number of color levels beyond 128

Rework Text and Command Windows
- Separate Text and Command Windows
- Move to a OS2-like arrangement
- Multiple windows available for each image/graphic window

Run applications from a Unix shell
- X windows environment no longer needed
- Two modes:
  - Run a single command, which makes its own User Common and Frame Storage, then removes them when finished
  - Create a McIDAS environment, run several commands, then delete the environment
- "Background" production of products

Future Technology for McIDAS

Jean Stine

Future Technology for McIDAS

Jean M. Stine
Systems Integrator and Manager

1995 MUG Meeting

Future Technology for McIDAS

- Vendor Software for McIDAS-OS2
- Vendor Hardware for McIDAS-OS2
- McIDAS-X Operating Systems
- Hardware Being Considered for McIDAS-X
- Procuring McIDAS-X

Vendor Software for McIDAS-OS2

- Current operating system and compilers
  - IBM OS/2 version 3(WARP)
  - WARP supported with June 1995 upgrade
  - f2c
  - GNU

Notes

Vendor Software for McIDAS-OS2

- Future considerations
  - IBM OS/2 3.1 (release slated for June 1996)
  - No Operating System changes planned for next upgrade
  - Planned McIDAS-OS2 support for new version of AT&T f2c Fortran compiler (version 19950906)

Vendor Hardware for McIDAS-OS2

- Current hardware
  - IBM PS/2 models 70, 77, 80, 90, 95
  - WIDE WORD Workstations and SDAs supported on PS/2s only
- Future considerations
  - IBM PC700s replacing PS/2s
  - Presentation Manager and VGA display support on PC700s in next upgrade
  - No intended support for WWWs and SDAs on PC700s

McIDAS-X Operating Systems

Vendors	Current	Under Investigation
IBM	AIX 3.2.5p	AIX 4.1.3
HP	HP-UX 9.0.5	HP-UX 10.0
SGI	IRIX 5.3	IRIX 6.1 or 6.2
Sun	Solaris 2.4	Solaris 2.5

Notes

IBM AIX 4.x

- Significant changes
  - Directory structure
  - Maximum file system size increase (>2 GB)
  - Maximum file size increase (>2 GB)
  - Multi-processor (multi-threading) support
- Strategy
  - Our investigation begins in a few months
  - Impact unknown
  - Schedule for support unknown

Hewlett Packard HP-UX 10.x

- Significant changes
  - Works on both 700 and 800 series workstations
  - Journaled file systems
  - Multi-threading
  - Multiple partitions per disk
- Strategy
  - Our investigation begins in a few months
  - Impact unknown
  - Schedule for support unknown

SGI IRIX 6.x

- Significant changes
  - Currently runs on only the SGI R8000 systems (64-bit); future versions will run on R4000 and R8000 systems
  - Does not run on R3000 systems
- Strategy
  - McIDAS currently only runs on 32-bit systems
  - Possible support for McIDAS on IRIX 6.x with next upgrade

Notes

Compiler Software for McIDAS-X

- Fortran 90 compiler
  - IBM Fortran 90 compiler recently introduced; Fortran 77 compile mode used for McIDAS-X
  - No plans to migrate to Fortran 90
- C/C++ compiler(s)
  - No current plans to support McIDAS using C++

Hardware Being Considered for McIDAS-X

- IBM PowerPC-based RS/6000
- R8000-based SGI
- HP 800 Series
- HP J200 Series

IBM PowerPC-based RS/6000

- Uses the IBM PowerPC processor
- Very affordable
- Good integer performance
- Floating point performance not as good as Power- and Power2-based systems
- Under consideration for future McIDAS upgrades

Notes

R8000-based SGI

- 64-bit system
- Requires IRIX version 6.0 or greater
- Good floating point performance
- Limited tape device support native on OS
- Working towards support for next McIDAS-X upgrade

HP 800 Series

- Based on HP's original product line
- Requires HP-UX 10.x
- Designed for serving data
- Development for HP-UX 10.x should make hardware architecture transparent
- Under consideration for future McIDAS upgrades

HP J200 Series

- Based on the HP Apollo 700 series
- Designed as multi-processor; can configure as a uni-processor or multi-processor
- 64-bit CPU
- Possible McIDAS- X support for next upgrade

Notes

Procuring McIDAS-X

- Before purchasing a new system to run McIDAS-X, contact your SSEC Program Manager to discuss:
  - McIDAS-X costs
  - Vendor hardware requirements; request the booklet *Purchasing Information for McIDAS-X, -XCD, and -XSD Workstations*
  - Vendor software requirements

Notes

McIDAS Applications Testing Process

John Pyeatt

McIDAS Applications Testing Process

John Pyeatt
MUG Program Manager

1995 MUG Meeting

McIDAS Applications Testing Process

- Preparation
- McIDAS-X Testing Matrix
- McIDAS-OS2 Testing Matrix
- Testing
- Final Steps

Preparation

- Select and schedule hardware for testing
- Build testing plan timelines
  - Upgrade operating systems
  - Assign tester to specific configurations
  - Cover all supported configurations
- Acquire loaner systems (as necessary)
- Set software freeze date about one month before distribution

Notes

McIDAS-X Testing Matrix

Operating System	Platform	Fortran Compiler
AIX 3.2.5c	IBM	XLF 2.3
AIX 3.2.5p	IBM	XLF 3.2
Solaris 2.3	Sun	
Solaris 2.4	Sun	
IRIX 5.3	SGI	
IRIX 5.4	SGI	
HPUX 9.0.3	HP	
HPUX 9.0.5	HP	

McIDAS-OS2 Testing Matrix (subset)*

OS	Display	Communications	Platform (PS/2)
2.11	PM	Direct Async	Model 95
2.11	SDA	Pronet	Model 70
2.11	VGA	Async Dial-In	Model 80
2.11	WWW	Direct Async	Model 80
3.0	PM	Async Dial-In	Model 95
3.0	SDA	TCP	Model 80
3.0	WWW	Pronet	Model 70
3.0	VGA	TCP	Model 70

* Full matrix is over 150 configurations

Testing

- Majority of commands tested using testing scripts
- Remaining commands tested manually
- Current system configurations fully tested
- Previous system configurations partially tested
- McIDAS-MVS applications tested manually

Notes

Final Steps

- Resolve any issues discovered in testing
- Distribute upgrade in-house
- Review updated documentation
- Prepare software for distribution
  - FTP
  - Diskettes
  - Tapes
- Write upgrade instructions
- Distribute upgrade

Notes

Day 2
October 25, 1995

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McIDAS Conventional Data Issues

John Pyeatt

McIDAS Conventional Data Issues

John Pyeatt
MUG Program Manager

1995 MUG Meeting

McIDAS Conventional Data Issues

- National Weather Service Changes
- Station ID Tables
- December 1995 McIDAS-XCD Addendum
- Moving McIDAS-XCD Applications

National Weather Service Changes

- New METAR format scheduled for June 1, 1996
- New Aerodrome Forecasts (TAF) scheduled for January 1, 1996
- Severe Weather/Tornado Watch Boxes replaced with county descriptions on January 1, 1996
- ETA model resolution transmission changes from 80 km to 48 km; no date scheduled

Notes

Station ID Tables

- Station changes occur daily
- Six- to nine-month update cycle not timely enough
- Updated files available on MUG BBS
  - Updated monthly
  - ID Master Station List IDMSL for McIDAS-X, -OS2, and -MVS
  - Station dictionary list for McIDAS-XCD and -MVS
  - IDU

December 1995 McIDAS-XCD Addendum

- New decoder for severe weather watches and warnings
- WMO TAF format changes January 1, 1996

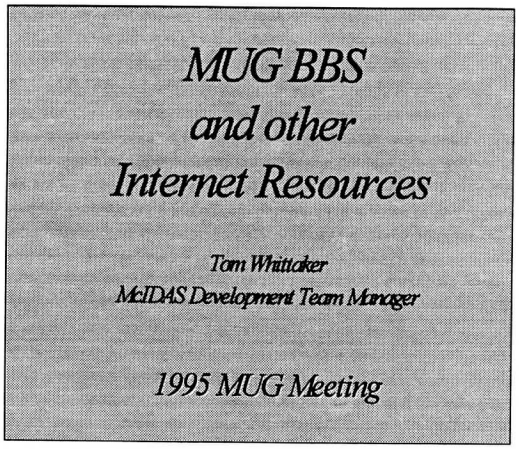
Moving McIDAS-XCD Applications

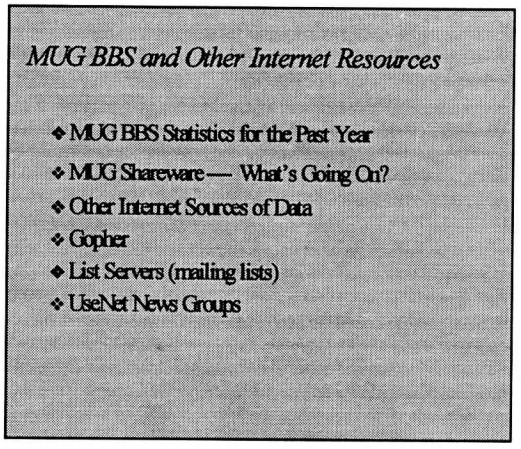
- Most user commands will move to McIDAS-X and -OS2 in ADDE implementation
- Many library functions will move to McIDAS-X and -OS2 library
- McIDAS-XCD operations-specific commands will not be moved

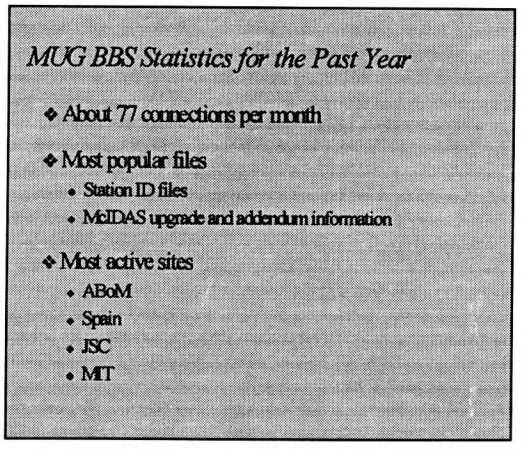
Notes

MUG BBS and Other Internet Resources

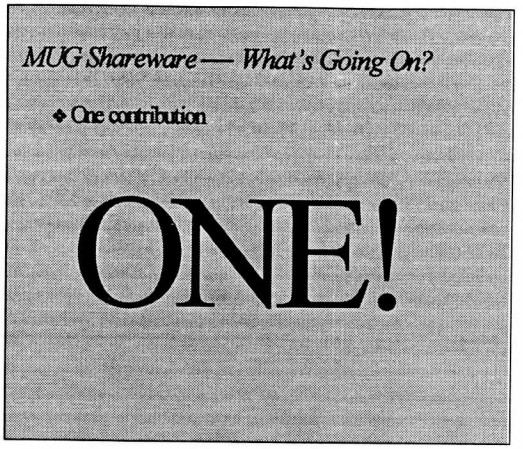
Tom Whittaker

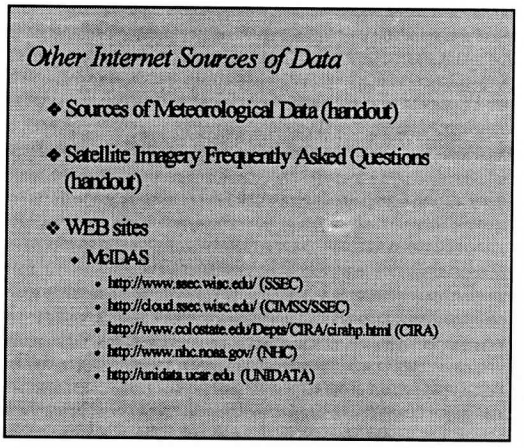

MUG BBS
and other
Internet Resources
Tom Whittaker
McIDAS Development Team Manager
1995 MUG Meeting

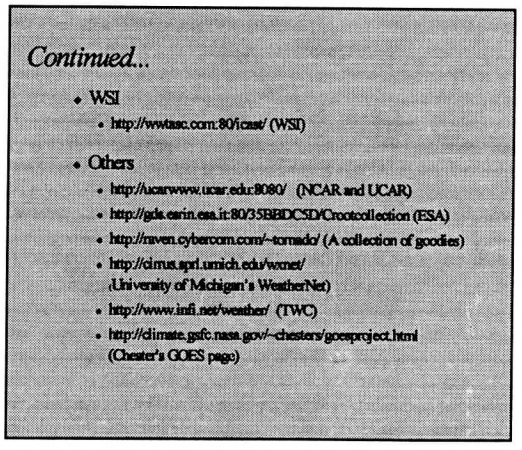

MUG BBS and Other Internet Resources
MUG BBS Statistics for the Past Year
MUG Shareware — What's Going On?
Other Internet Sources of Data
Gopher
List Servers (mailing lists)
UseNet News Groups


MUG BBS Statistics for the Past Year
About 77 connections per month
Most popular files
Station ID files
McIDAS upgrade and addendum information
Most active sites
ABoM
Spain
JSC
MIT

Notes


MUG Shareware — What's Going On?
One contribution
ONE!


Other Internet Sources of Data
Sources of Meteorological Data (handout)
Satellite Imagery Frequently Asked Questions (handout)
WEB sites
McIDAS
http://www.ssec.wisc.edu/ (SSEC)
http://cloud.ssec.wisc.edu/ (CIMSS/SSEC)
http://www.colostate.edu/Depts/CIRA/cirahp.html (CIRA)
http://www.nhc.noaa.gov/ (NHC)
http://unidata.ucar.edu (UNIDATA)


Continued...
WSI
http://wwtasc.com:80/icast/ (WSI)
Others
http://ucarwww.ucar.edu:8080/ (NCAR and UCAR)
http://gds.earin.esa.it:80/35BBDCSD/Crootcollection (ESA)
http://raven.cybercom.com/~tornado/ (A collection of goodies)
http://cimus.aprl.umich.edu/wxnet/ (University of Michigan's WeatherNet)
http://www.infi.net/weather/ (TWC)
http://climate.gsfc.nasa.gov/~chesters/goesproject.html (Chester's GOES page)

Notes

Continued...

- Others
  - http://ns.noaa.gov/NESDIS/NESDIS_Home.html (NESDIS home page)
  - http://www.wmo.ch/ (WMO)
  - http://www.naa.gov/ (NASA)
  - http://www.nssl.uoknor.edu/ (NSSL)
  - http://www.atmos.uiuc.edu/ (University of Illinois' The Daily Planet)
  - http://www.knmi.nl/home/Home.html (KNMI's page)
  - http://www.nos.noaa.gov/ (National Ocean Service)
  - http://www.sel.noaa.gov/ (Space Environment Laboratory)

Continued...

- Others
  - http://www.faa.gov/ (FAA)
  - http://www.nsf.gov/ (National Science Foundation)
  - http://www.odci.giv/ (Central Intelligence Agency)
  - http://newproducts.jpl.nasa.gov/calendar/ (Space Calendar)
  - http://www.cdc.noaa.gov/ (Climate Diagnostics Center)
  - http://nic.fb4.noaa.giv/ (Climate Prediction Center)
  - http://www.gfdl.gov/ (Geophysical Fluid Dynamics Laboratory)
  - http://www.fsl.noaa.gov/ (Forecast Systems Laboratory)
  - http://seaboard.ndbc.noaa.gov/ (National Data Buoy Center)

Continued...

- Others
  - http://www.usgs.gov (USGS)
  - http://www.dma.gov (DMA - Defense Mapping Agency)
    http://typhoon.rdg.ac.uk/rms/rms.html (Royal Meteorological Society)
  - http://www.nist.gov/ (National Institute of Standards & Technology)
  - http://www.si.edu/ (Smithsonian Institution)
  - http://www.doe.gov/ (Department of Energy)
  - http://femapub1.fema.gov/homepage.html (FEMA)
  - http://www.census.gov/ (U.S. Bureau of the Census)

Notes

Continued...

- Others
  - http://www.alden.com (Alden)
  - http://www.epa.gov/docs/ozone/index.html (EPA Ozone Information)
  - http://www.noaa.gov/noaa.html (NOAA)
  - http://rs560.cl.msu.edu/weather/ (Michigan State University)
  - http://thunder.atms.purdue.edu/ (WXP/Purdue)

Gopher

- AMS via atm.geo.nsf.gov
- EPA via gopher.epa.gov
- McIDAS MUG via gopher.ssec.wisc.edu

List Servers (mailing lists)

- WX-TALK
  - Anything in the meteorology world—mostly amateur
  - To subscribe: email listserv@vmd.cso.uiuc.edu In the first line of the body type: SUBSCRIBE *your name*
- WX-SAT
  - Satellite only
  - To subscribe: email wxsat-request@ssg.com In the first line of the body type: SUBSCRIBE *your name*

Notes

WX-Talk

To subscribe: email listserv@vmd.cso.uiuc.edu
In the first line of body type: **SUBSCRIBE** *your name*

WX-SAT

To subscribe: email wxsat-request@ssg.com
In the first line of body type: **SUBSCRIBE** *your name*

UseNet News Groups

- sci.geo.meteorology
  - Anything in the meteorology world—more professional
- bit.listerv.wx-talk (if available)
  - WX-TALK in UseNet News form
- sci.geo.eos
  - EOS related, some DAAC information, etc.

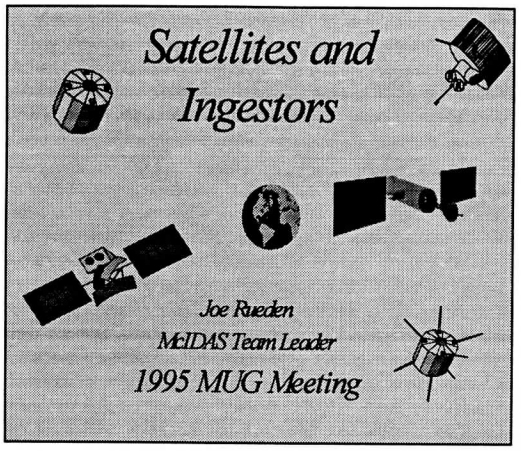
Continued...

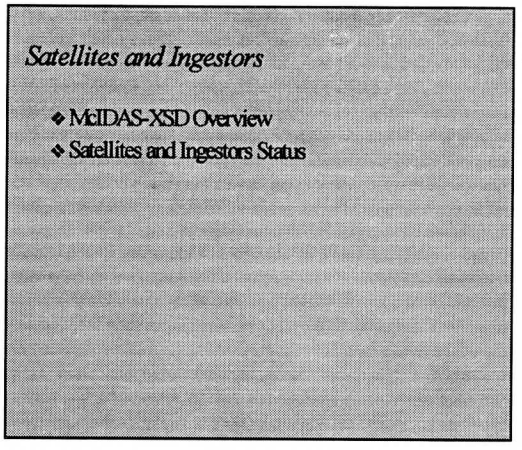
- sci.space.science — Space science issues
- ne.weather—a WX talk in New England
- ncar.weather—mostly week-old NWS statements

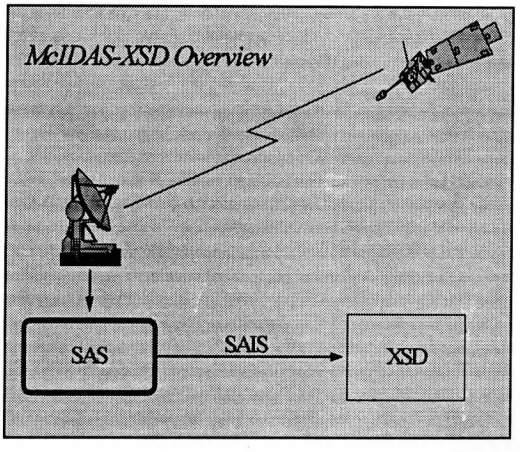
Notes

Satellites and Ingestors

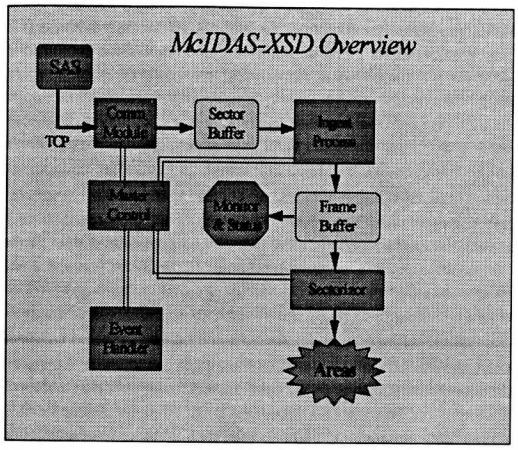
Joe Rueden


Satellites and Ingestors
Joe Rueden
McIDAS Team Leader
1995 MUG Meeting


Satellites and Ingestors
McIDAS-XSD Overview
Satellites and Ingestors Status


McIDAS-XSD Overview
SAS
SAIS
XSD

Notes



McIDAS-XSD Overview

- SAS (Satellite-data Acquisition System)
  - Hughes is the only vendor with operational units.
  - SDS (Soporte y Desarolla de Software) is developing units for POES, Meteosat, and GVAR.
  - Interest continues from other vendors.
- SAIS (Satellite-data Acquisition Interface Spec)
  - Level 1 is currently in use (single-signal version).
  - Level 2 is in open review (multi-signal version).
  - We are looking into IEEE certification as standard.

McIDAS-XSD Overview

- McIDAS-XSD
  - Support is currently limited to specific combinations of ingestors and platforms.
  - We will restructure for Distributed Event Scheduler and Operations Console.
  - We will make installable by Unix Systems Administrator.
- Related work
  - ADDE server interfaces are being built for non-MUG ingest packages.
  - Remember your long term support needs when using non-MUG ingest packages.

Notes

Satellites and Ingestors Status

- GOES
- GMS
- POES
- POES Relay
- DMSP
- Meteosat
- Other Satellites
- Mainframe Ingestors

GOES

- GOES-7 (AAA) satellite
  - GOES-7 at 135° W; orbit is degrading
  - GOES-7 planned shutdown is January 11, 1996
- McIDAS-XSD AAA ingestor
  - Operational at SSEC on HP
  - Pathfinder will do limited additional processing
  - AAA archive retrieval scheduled for 1996

GOES

- GOES-8 (GVAR) satellite
  - Routine operations since November 1994
  - Imager operational since March 1995 at 75° W
  - Navigation variable
  - Sounder not yet operational
- GOES-9 (GVAR) satellite
  - Launched April 1995
  - Now testing ground system modifications
  - Begin move to 135° W planned for December 1995
  - Imager operational planned for January 1996

Notes

GOES

- GOES-K (GVAR) satellite
  - Launch planned for March 13, 1997
- McIDAS-XSD GVAR ingestor
  - Demo imager in Madrid planned for December 1995
  - Beta at Cape Canaveral and VAFB planned for early 1996
  - Imager and Sounder operational planned for first half of 1996

GMS

- GMS-4 became backup satellite in June 1995
- GMS-5 satellite
  - Launched March 1995; operational since July
  - No encryption
  - No satellite relay planned for continental U.S.
  - Full calibration under investigation (expect addendum)
- McIDAS-XSD GMS ingestor
  - Beta installed at ABoM in March 1994
  - GMS-5 update installed at Kwajalein and ABoM in June 1995

POES

- NOAA-12 and -14 are operational.
- NOAA-K planned launch date is ~~December 1995~~ AUGUST '96.
  - New AMSU sensor
  - Updated AVHRR instrument
  - Six-month checkout period
  - Considerable ingestor and calibration changes needed
- NOAA-L planned launch date is ~~June 1996~~ JULY '97
- NOAA-M planned launch date is July 1996. JUNE '98

Notes

POES

- McIDAS-XSD POES ingestor
  - HRPT installations
    - Vandenberg Air Force Base (VAFB), August 1994
    - SSEC, January 1995
    - Kwajalein, March 1995
  - TIP (TOVS) update installed September 1995

POES Relay

- POES Relay
  - Wallops and 'Gilmore Creek' relays still operational
- McIDAS-XSD POES Relay ingestor
  - GAC, LAC, and HRPT (POES Relay) installed; operational at SSEC since June 1995
  - Uses SSEC ingest card (not SAS)

DMSP

- DMSP satellites
  - Operational satellites: F-10, -11, -12, -13
  - F-11 OLS out; may be repaired
- McIDAS-XSD DMSP ingestor
  - OLS installed at VAFB, April 1995; Kwajalein, July 1995
  - SSM/I installed at VAFB & Kwajalein, September 1995
  - SSM/T (T1 and T2) not planned

Notes

DMSP

- Convergence study
  - Planning to merge three missions:
    - NOAA series (NOAA-N)
    - DMSP series (F-17?)
    - EOS p.m. platform
  - U.S. supplies instruments to EUMETSAT for a.m. satellite (METOP-1)
  - Affects launches after Fiscal Year 2000

Meteosat

- Met-3 shut down June 1995; SSEC has archive
- Met-4 shut down November 1995
- Met-5 operational at 0°
  - Full encryption expected December 1, 1995
  - Data use and distribution restrictions apply
- Met-6 at 10° W; backup for Met-5
- McIDAS-XSD Meteosat ingestor
  - Demo in Madrid planned for December 1995
  - Operational planned for first half of 1996

Meteosat

- NOAA has negotiated special U.S. arrangements.
- General data restrictions
  - Decrypter (key and decrypt units) needed
  - All data freely distributable after 48 hours
  - Data defined to include "any representation which is obviously Meteosat, including video broadcast"
- Contact is Hans Meyer of EUMETSAT
  - Phone (from U.S.): 011 49 615 1807 815
  - Fax (from U.S.): 011 49 615 1807 555
  - Email: meyer@eumetsat.de

Notes

Meteosat

- Real-time data restrictions
  - Six-hourly data is free and distributable globally.
  - Three-hourly data is free to all in U.S.; may not distribute outside U.S.
  - Half- and three-hourly data are free for NOAA official business anywhere in the world, and for research and education use within the U.S.
- All other use is expensive.

Other Satellites

- GOMS/ELEKTRA (Russian geosynchronous)
  - Launched early 1995 – parked near INSAT
  - Little information available; will pursue
- SeaWIFS (polar)
  - Similar to POES with different and additional channels
  - Real-time data must be purchased from private firm

Other Satellites

- Feng Yun (FY - Chinese meteorological satellites)
  - FY-2 (geosynchronous, like GMS-5) launch March 1996
  - FY-1c and d (polar, AVHRR) launch 1997-1999
- MODIS Moderate Resolution Imaging Spectrometer
  - On EOS platform (polar)
  - Extremely high bandwidth and resolution
  - 37 bands
  - 1998 scheduled launch
- Other satellite McIDAS-XSD ingestors, depending on user interest

Notes

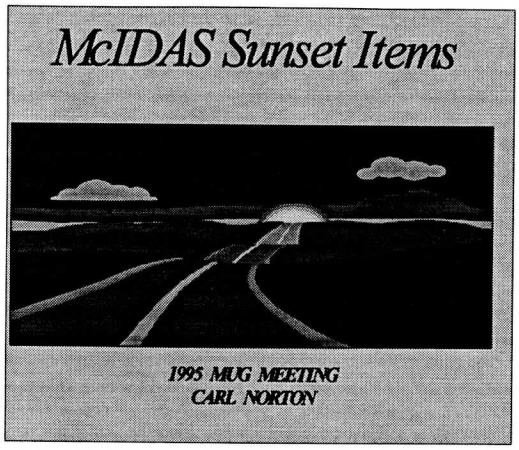
Mainframe Ingestors

- No new satellite development planned
  - No DMSP support
  - No GMS-5 full calibration support
  - No NOAA-K series support
- Support for changes to other signals depends upon needs of MUG community and resources at SSEC

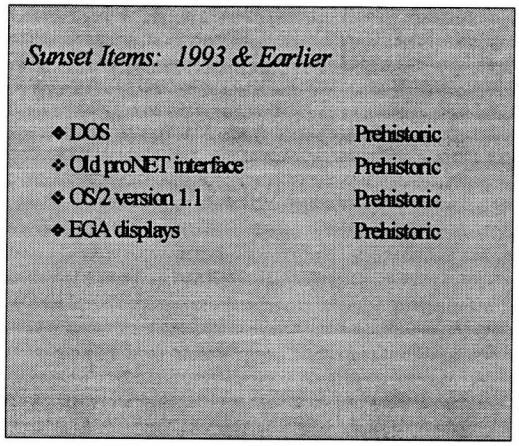
Notes

McIDAS
Sunset Items

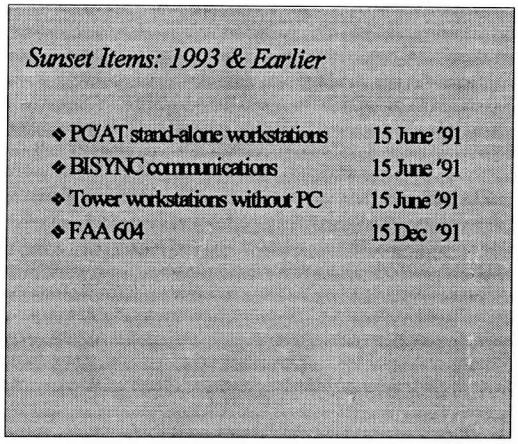
Carl Norton



Notes



The sunset history remains unchanged from the last MUG meeting.



Sunset Items: 1993 & Earlier

◆ TCP/IP for OS/2 version 1.1	15 Feb '92
◆ OS/2 version 1.2	15 Feb '92
◆ INSVCT decoder	15 June '92
◆ 286-based PCs	15 Apr '93

Notes

In the case of 286 based PCs, we found that supporting this processor was severely restricting the evolution of McIDAS.

Sunset Items: 1994

◆ OS/2 version 1.3	1 Jan '94
◆ Old METEOSAT frame sync	15 Mar '94
◆ Kavouras CIS	15 Dec '94
◆ SGI Personal Iris (IRIX 5.1)	31 Dec '94

The Kavouras Concurrent Ingest System (CIS) was the proprietary radar data acquisition device used to dial into individual radar sites.

The non-datastreaming GPCI sunset announced for April, 1994 was rescinded.

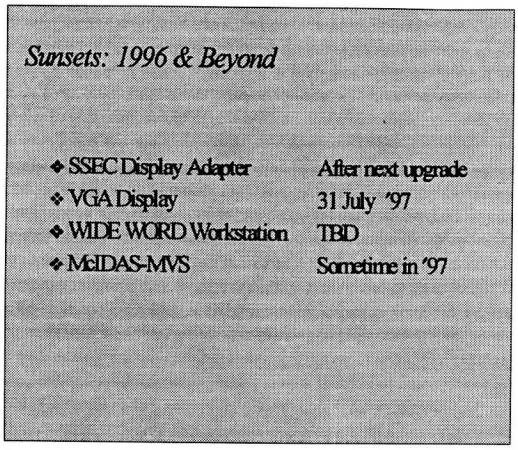
Sunset Items: 1995

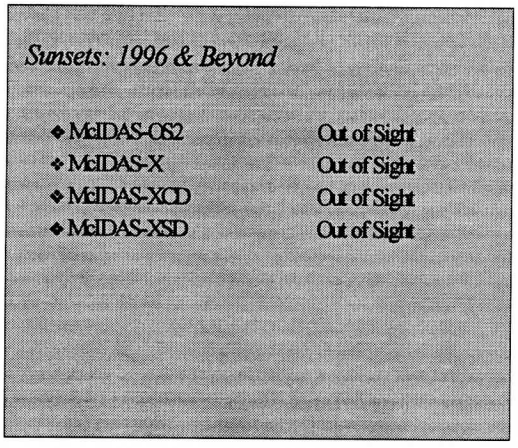
◆ McIDAS-MVS GMS Ingestor	1 Jun '95
◆ Operating Systems	
• OS/2 version 2.1.1	15 Dec '95
• AIX version 3.2.5C	15 Dec '95
• HP-UX version 9.0.3	15 Dec '95
• SunOS version 4.1.3	15 Dec '95
• Solaris version 2.3	15 Dec '95
• SGI IRIX version 5.2	15 Dec '95
◆ Tower workstations	31 Dec '95

There are no longer any sites using the mainframe GMS ingestor.

Tower workstations are based on technology that is well over a decade old.

Refer to the presentation on supported hardware and software for information on currently supported platforms and future support plans.





Notes

Several factors have prompted the sunset of the SDA workstation:

- limited use
- lowering costs of Unix workstations
- adding support for McIDAS-PM

The PM display mode for McIDAS-OS2 represents significant increase in usability over the VGA display, while retaining the advantage of not requiring expensive add-on hardware to obtain the following:

- flexible window size
- multiple windows simultaneously displaying different data
- increased number of colors/gray levels
- automatic resizing

This mode of display is far superior to the VGA when used on high-speed machines (>100 MHz), and has been shown to be effective on slower PCs as well.

We are re-evaluating the WWW sunset date announced at the last meeting. We had expected that Unix workstations would attain all the functionality of the WWW by the planned sunset time frame. It does not now appear that this is happening.

In the coming year we will examine the MVS sunset issue and provide a specific date for sunset. Full support will end on that date; however, we are considering providing some limited support beyond that date. We solicit comments on this strategy from the McIDAS community. To our knowledge, no existing MUG site plans to use McIDAS-MVS after 1996.

The sunset of McIDAS-MVS carries with it much of the associated SSEC built hardware: multisourcerers, GOES ingestors, GVAR ingestors, etc. Not included in the sunset are antenna chain components such as frame sands, bi-level converters and frequency converters. These components will still be supported in the distributed Unix environment era.

MUG
Business Affairs

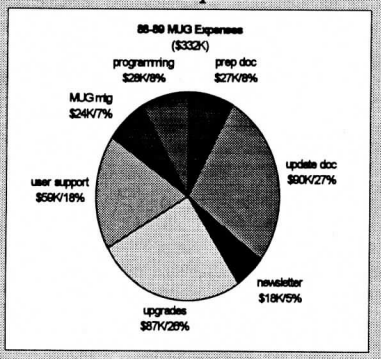
Bob Fox

MUG Business Affairs

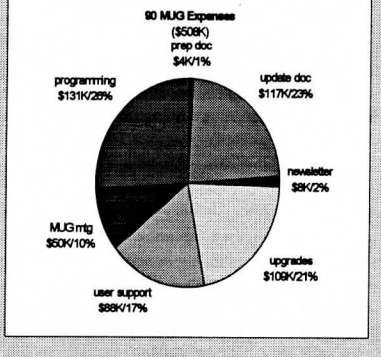
Bob Fox

1995 MUG Meeting

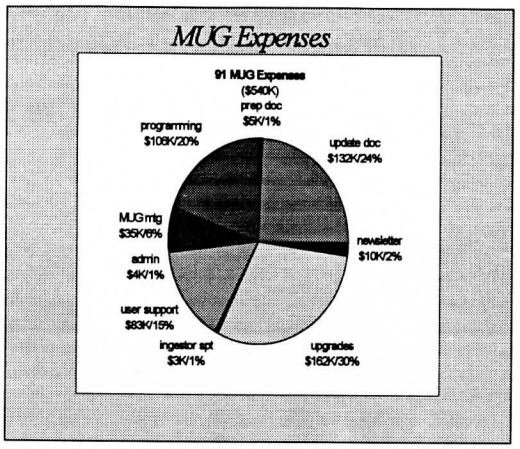
MUG Expenses

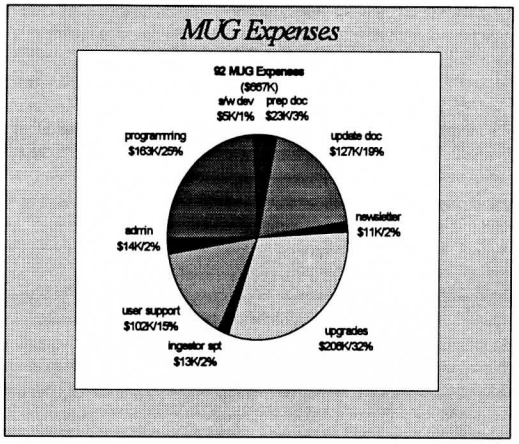


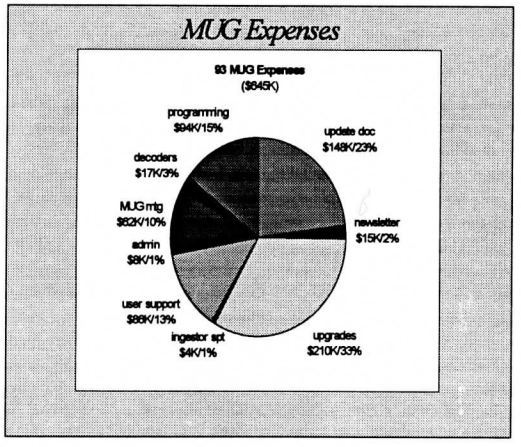
MUG Expenses



Notes

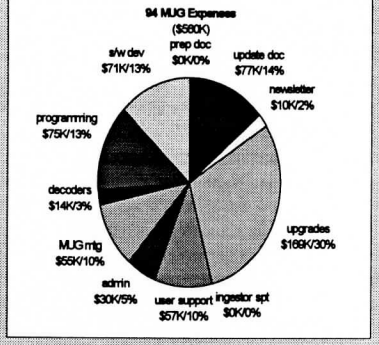

MUG Expenses
91 MUG Expenses
($540K)
prep doc
$5K/1%
programming
$108K/20%
update doc
$132K/24%
MUG mtg
$35K/6%
newsletter
$10K/2%
admin
$4K/1%
user support
$83K/15%
ingestor spt
$3K/1%
upgrades
$162K/30%


MUG Expenses
92 MUG Expenses
($687K)
s/w dev
$5K/1%
prep doc
$23K/3%
programming
$163K/25%
update doc
$127K/19%
newsletter
$11K/2%
admin
$14K/2%
user support
$102K/15%
upgrades
$208K/32%
ingestor spt
$13K/2%

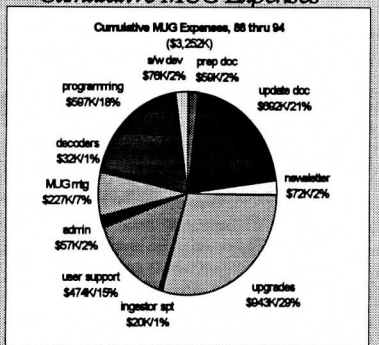

MUG Expenses
93 MUG Expenses
($645K)
programming
$94K/15%
update doc
$148K/23%
decoders
$17K/3%
MUG mtg
$62K/10%
newsletter
$15K/2%
admin
$8K/1%
user support
$86K/13%
ingestor spt
$4K/1%
upgrades
$210K/33%

Notes

MUG Expenses



Cumulative MUG Expenses



MUG Fees

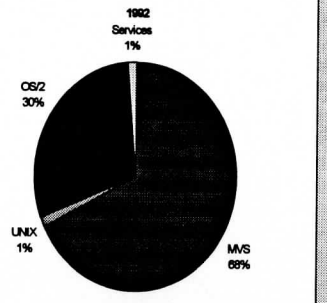
Category	cy93	cy94	cy95	cy96	cy97	cy98
MVS	29,000	28,000	30,000	35,000	42,000	50,000
OS2 (1)	3,000	3,000	3,000	3,150	3,300	3,460
OS2 (>1)	6,000	6,000	6,000	6,300	6,600	6,900
X (1)	6,000	6,000	6,000	6,300	6,600	6,900
X (>1)	12,000	12,000	12,000	12,600	13,200	13,800
XCD	4,000	4,000	4,000	4,200	4,400	4,600
XSD (per set)	4,000	4,000	4,000	4,200	4,400	4,600

Notes

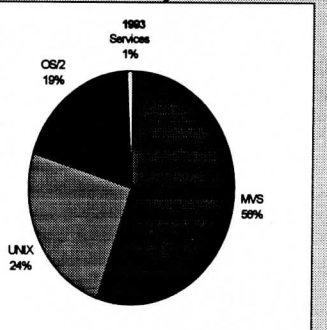
MUG Financial History and Forecast

	Income	Expenses	Year Bal	Cum Balance
CY88	$0	$77,813	($77,813)	($77,813)
CY89	282,865	253,747	$9,118	(68,695)
CY90	369,111	507,811	($138,700)	(207,395)
CY91	468,025	540,444	($72,419)	(279,814)
CY92	534,316	666,665	($132,349)	(412,163)
CY93	719,850	644,848	$74,802	(337,361)
CY94	710,151	560,256	$149,895	(187,466)
CY95 est	836,000	750,000	$86,000	(101,466)
CY96 est	826,200	760,000	$66,200	(35,266)

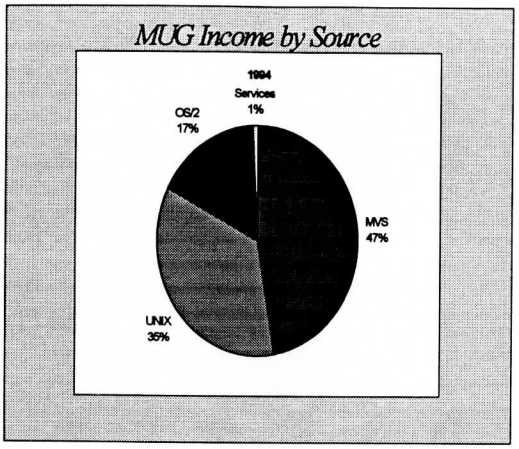
MUG Income by Source

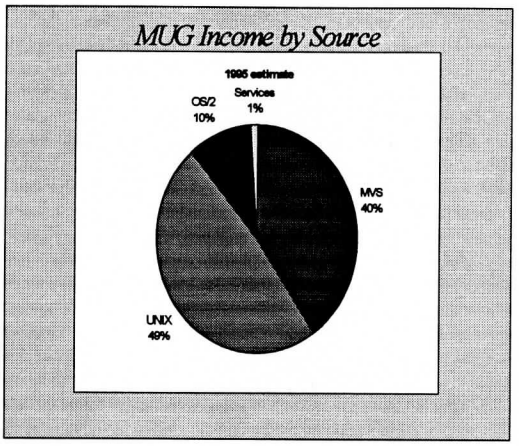


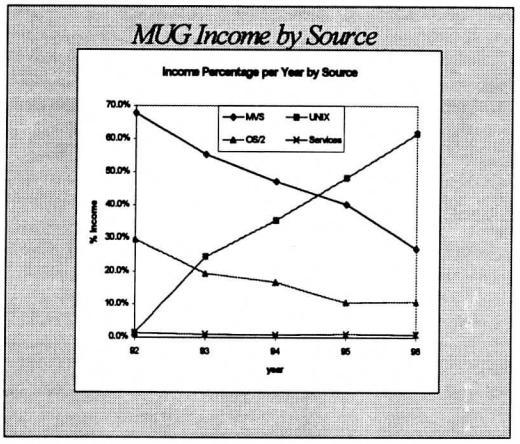
MUG Income by Source



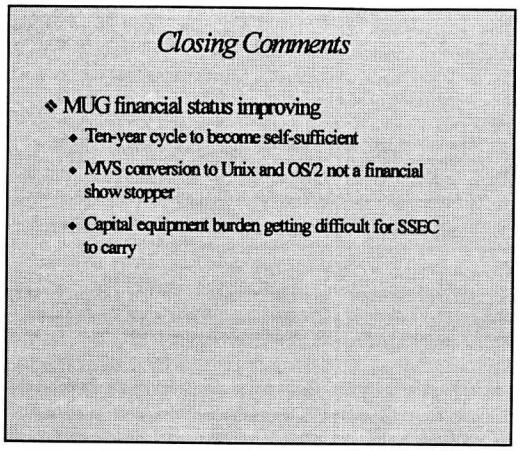
Notes

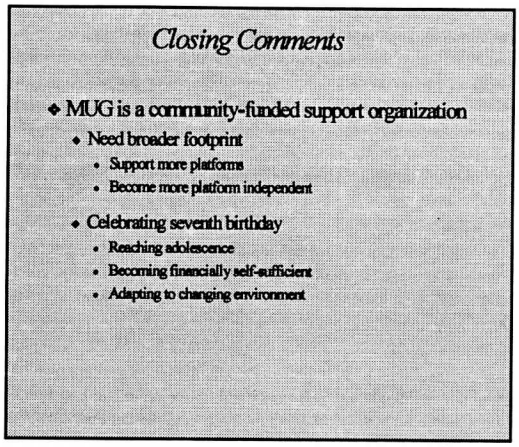

MUG Income by Source
1994
Services
1%
OS/2
17%
MVS
47%
UNIX
35%


MUG Income by Source
1995 estimate
Services
1%
OS/2
10%
MVS
40%
UNIX
49%


MUG Income by Source
Income Percentage per Year by Source
MVS
UNIX
OS/2
Services
% Income
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
92
93
94
95
96
year

Notes


Closing Comments
MUG financial status improving
Ten-year cycle to become self-sufficient
MVS conversion to Unix and OS/2 not a financial show stopper
Capital equipment burden getting difficult for SSEC to carry


Closing Comments
MUG is a community-funded support organization
Need broader footprint
Support more platforms
Become more platform independent
Celebrating seventh birthday
Reaching adolescence
Becoming financially self-sufficient
Adapting to changing environment

Notes

Sources of Meteorological Data

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Introduction to the sci.geo.meteorology FAQs

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/faq-intro
Last-modified: 12 Sep 1995

Recent changes:
New document

If you would like to put this article in an archive and want to receive a new copy automatically at every update, please send me email. I DO NOT MAINTAIN A MAILING LIST SO PLEASE DON'T ASK FOR ME TO SEND YOU COPIES AT EACH UPDATE UNLESS YOU ARE ARCHIVING IT FOR PUBLIC USAGE OR FURTHER REDISTRIBUTION!

Corrections, additions, and comments should be sent to Ilana Stern at ilana@ncar.ucar.edu. Please include in your message where you read this document. Note that if I know about it, it's in this document.

If the date in the headers of the document you're reading is more than a month old, you should retrieve a current copy. Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

This is the introduction to a series of FAQ postings for the Usenet newsgroup sci.geo.meteorology. "FAQ" stands for Frequently Asked Questions: these postings are intended to answer the general question, "Where can I get <X>?" for just about any value of <X> which has anything to do with meteorology.

This FAQ series grew out of a FAQ which was much smaller in scope, the "Sources of Meteorological Data FAQ" which identified Internet and other sources of meteorological data for both the hobbyist and the researcher. The bulk of this FAQ series is still about data sources, but a lot of other information has been added.

The following postings comprise the FAQ series:

Subject: Meteorology FAQ Part 1/7: Intro
Summary: Introduction to the sci.geo.meteorology FAQs
Archive-name: meteorology/faq-intro

Subject: Meteorology FAQ Part 2/7: Sources of weather data
Summary: Weather data available via the Internet
Archive-name: meteorology/weather-data

Subject: Meteorology FAQ Part 3/7: Sources of research data
Summary: Research and miscellaneous data available via the Internet
Archive-name: meteorology/research-data

Subject: Meteorology FAQ Part 4/7: Sources of CD-ROMs
Summary: Weather and research data available via CD-ROM
Archive-name: meteorology/cdroms

Subject: Meteorology FAQ Part 5/7: Internet resources
Summary: Mailing lists, newsgroups, institutional home pages etc.
Archive-name: meteorology/net-resources

Subject: Meteorology FAQ Part 6/7: Print and other resources
Summary: Books for scientists and laymen, journals, societies etc.
Archive-name: meteorology/print-resources

Subject: Meteorology FAQ Part 7/7: List of US State Climatologists
Summary: List of US State Climatologists and Regional Climate Centers
Archive-name: meteorology/state-climatologists

~Subject: 3) Where to find the FAQs

This FAQ series is posted to sci.geo.meteorology, news.answers, and sci.answers every two weeks; it also appears on the mailing lists CLIMLIST and met-stud.

Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

This information, particularly the internet resources lists, changes rapidly. If the date in the headers of the document you're reading is more than a month old, you should retrieve a more current copy.

~Subject: 4) How to use the file retrieval methods

This section only describes FTP and telnet in any detail; for other methods, FTP sites are given, so you can get information on them yourself.

How to use FTP

FTP (File Transfer Protocol) allows transfer of files between two computers which are on the Internet. To access the FTP areas listed here, at your system prompt type "ftp" followed by the name of the desired system. For example, to access ncardata.ucar.edu you'd type
ftp ncardata.ucar.edu
Use "anonymous" as your login and your email address as the password (if requested).

[Note: quotes ("like this") are used to set off names of directories and files, or commands you'd type, and are not part of these names.]

Not all FTP systems accept the same commands, but here's a list of the most useful:

ls: list files in the current directory.
cd: change directory, e.g. "cd wx" changes to the wx directory.
binary: sets binary mode
ascii: sets ascii mode (the default). Use for retrieving text.
get: retrieves a file, e.g. "get readme" gets a file called readme.
bye: exits FTP.

If you can't seem to connect to the site, check to see if it is a telnet site. If it is, follow the instructions in the following section instead.
If you can't FTP from your site, use one of the following ftp-by-mail servers:
ftpmail@decwrl.dec.com
ftpmail@src.doc.ic.ac.uk
ftpmail@cs.uow.edu.au
ftpmail@grasp.insa-lyon.fr
ftpmail@ftp.uni-stuttgart.de

Send an e-mail message to the closest address, with the lines:
reply your_address@some.where <- with your email address
connect ncardata.ucar.edu <- for example
cd datasets/ds111.2/software
get access_sun.f
quit

For complete instructions, send a one-line message reading "help" to the server. Please don't ask me for help!

How to use telnet

Type "telnet" followed by the name or IP number of the desired system. These publicly accessible systems generally allow you to log in but put you in a restricted shell, from which only a certain menu of commands is available. The description for the site will include the login to use.
If you can't seem to connect to the site, re-check its description in the document; if it's an FTP site, follow the instructions in the previous section instead.

Gopher information

Available by ftp at <URL:ftp://rtfm.mit.edu/pub/usenet/news.answers/gopher-faq>.

Wais information

Available by ftp at
<URL:ftp://rtfm.mit.edu/pub/usenet/news.answers/wais-faq/getting-started>.

WWW information

Available by ftp at <URL:ftp://rtfm.mit.edu/pub/usenet/news.answers/www/faq>.
WWW is so easy to use that you might as well just hop in and try it, so ask your sysadmin if you have a WWW browser such as NCSA Mosaic or Netscape.

Part 2/7
Summary: Weather data available via the Internet

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/weather-data
Last-modified: 12 Sep 1995

Recent changes:

==within last two weeks==
Added <URL:http://www2.mry.noaa.gov/nwspage/nwshome.html> San Francisco NWS to regional weather section
Added <URL:http://www.nhc.noaa.gov/>, NOAA's National Hurricane Center, to severe weather section
Added <URL:http://acro.harvard.edu/GA/av_weather.html> Aviation weather to specialty section

==within last four weeks==
Major reorganization
Changed URLs to conform to RFC 1808
Removed dead links
Added <URL:http://www.ems.psu.edu/wx/> to North America, regional weather sections
Added <URL:ftp://downdry.atmos.colostate.edu/pub/> to severe weather section
Added Regional Climate Center links to this section
Added <URL:http://www.iohk.com/UserPages/ckfong>, Weather Underground of Hong Kong.
Added <URL:http://www.cdc.noaa.gov/~cas/boulder.html> Boulder weather/climate to regional weather section
Added <URL:http://www.mrc.uidaho.edu/weather/weather.html> Idaho weather to regional weather section
Added commercial services section (#18)
Added <URL:http://mars.jdsoft.com/index.html> for Lightning! commercial package
Added <URL:http://www.oceanweather.com/~oceanwx/data.html> for marine obs
Added <URL:http://www.vcnet.com/goldcoastwx/cscalwx.html> for southern California regional weather
Added <URL:http://www.vcnet.com/goldcoastwx/home.html> to commercial section
Added <URL:http://www.ml.csiro.au/~lband/index.html> to Australia and New Zealand section
Added <URL:http://www.station.net/~kenf/tcc.html> Tropical Cyclone Centre to severe weather section
Added <URL:http://www.met.fu-berlin.de/extern/Meteofax/index.html> German weather forecasts
Added <URL:http://www.meteo.fr:80/tpsreel/bulletin.html> French weather forecasts
Added <URL:http://www.public.se:80/weather/worldindex.english> general global forecasts

Added <URL:http://www.public.se:80/weather/weatherindex> Forecasts for Sweden

If the date in the headers of the document you're reading is more than a month old, you should retrieve a current copy. Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:

Meteorology FAQ Part 1/7: Intro
Meteorology FAQ Part 2/7: Sources of weather data <===
Meteorology FAQ Part 3/7: Sources of research data
Meteorology FAQ Part 4/7: Sources of CD-ROMs
Meteorology FAQ Part 5/7: Internet resources
Meteorology FAQ Part 6/7: Print and other resources
Meteorology FAQ Part 7/7: List of US State Climatologists

Corrections, additions, and comments should be sent to Ilana Stern at ilana@ncar.ucar.edu. Please include in your message where you read this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

Sites listed in this section contain weather data: satellite images, forecast maps, soundings, and so on. Some sites appear more than once under different subject headings. Some sites have identical contents; please use the site closest to you.

Most of these sites have current or near-current data; some of them have data from severe events of historical significance, such as major storms. There's very little historical daily data freely available via the Internet. Part of the reason for this is the enormous volume; it takes very little space on a disk to store today's conditions, but when you multiply that by 365 days per year for however many years, it becomes quite a bit.

For most purposes, though, this kind of data isn't needed. If you want to plan an outdoor event in, say, Greenbelt, MD on July 17, knowing what the weather was like on previous July 17ths isn't really very helpful. If this is the sort of thing you're looking for, try looking in an almanac, which usually have tables for monthly or seasonal conditions in major cities.

If you really need historical information for a US location, your best bet would be to try the Regional Climate Center for the area of interest. Several have WWW pages or email contacts; otherwise, see the Meteorology FAQ Part 7/7: List of US State Climatologists for addresses and phone numbers of RCCs and State Climatologists, who may also be able to help. The list is also available at <URL:ftp://ncardata.ucar.edu/catalogs/contacts/state_climatologists>. Also, see the Meteorology FAQ Part 3/7: Sources of research data for climate data. Some monthly and seasonal climatologies are available for free.

~Subject: 3) Comprehensive weather sites

These sites all focus on North America, but many include data for other parts of the world as well. These sites all contain a variety of weather-related information: satellite images, surface and upper-air analyses and plots, text forecasts, and so on.

<URL:http://www.atmos.uiuc.edu/wxworld/>
Weather World from the University of Illinois. Satellite images, surface and upper air analyses, forecast model output, etc. This server also includes a very nice and comprehensive collection of MPEG movies based on the still images. They are updated hourly and they cover various time durations of up to over two days.

<URL:gopher://wx.atmos.uiuc.edu:70/>
University of Illinois Weather Machine. Satellite images, surface and upper-air analyses, text weather forecasts, local (Illinois) weather, and various useful documents, including GRIB and ON84 format descriptions, station lists, graphics information, etc. Not as slick as Weather World, but contains more information. Questions, comments, and requests for changes should be sent to gopher@wx.atmos.uiuc.edu.

<URL:http://thunder.atms.purdue.edu/>
Purdue University WXP Web site. This site includes satellite images, surface plots and analyses, upper air plots and analyses, soundings, radar, and plots of the results from various NMC forecast models. The text on each page explains very clearly the meteorological usefulness and interpretation of the various plots. Questions and comments to devo@cell.atms.purdue.edu.

<URL:gopher://geograf1.sbs.ohio-state.edu/>
Forecasts for US, Canada, Caribbean; severe weather, NMC products, tropical observations and forecasts, marine and aviation weather; satellite images and analyses for US including Alaska, and Antarctica; surface plots for US, Europe, China.

<URL:http://iwin.nws.noaa.gov/iwin/main.html>
The National Weather Service's Interactive Weather Information Network. Various data products for the US in general and for the states, mostly via imagemaps.

~Subject: 4) North America

Other sites with a variety of weather information for North America:

<URL:ftp://early-bird.think.com/pub/weather/maps/>
<URL:ftp://ftp.uwp.edu/pub/wx/>
<URL:ftp://kestrel.umd.edu/pub/wx/>
<URL:ftp://wmaps.aoc.nrao.edu/pub/wx/>
<URL:ftp://wuarchive.wustl.edu/multimedia/images/wx/>
These sites are all mirrors of the same archive of satellite images and upper air and surface plots.

<URL:gopher://downwind.sprl.umich.edu/11/Weather_Text>
<URL:telnet://downwind.sprl.umich.edu:3000/>
<URL:telnet://hermes.merit.edu/>
<URL:telnet://measun.nrrc.ncsu.edu:3000/>
<URL:telnet://thunder.met.fsu.edu:3000/>
<URL:telnet://vortex.weather.brockport.edu:3000/>
<URL:telnet://wind.atmos.uah.edu:3000/>
These sites are Weather Undergrounds (US/Canada fcsts, global reports, ski conds, severe wx). There is also the Weather Underground WWW home page at <URL:http://cirrus.sprl.umich.edu/>.

<URL:gopher://metlab1.met.fsu.edu/>
This gopher site includes surface plots and analyses, model output plots, upper air analyses, soundings, and radar, all for the US (some Canadian plots), and text forecasts for Florida. <URL:ftp://ftp.met.fsu.edu> can be accessed via this site. A home page in html for use with WWW browsers is <URL:gopher://metlab1.met.fsu.edu:70/h0/Index>.

<URL:http://www.intellicast.com/>
Satellite images, radar summary, a few analyses, plus text forecasts and other information for many US cities. A few cities have a lot of detailed information.

<URL:http://wxweb.msu.edu/weather/>
Satellite images, 6-panel and radar summary images, surface analyses.

<URL:http://www.dow.on.doe.ca/>
Environment Canada. Forecasts, charts, satellite photos over Canada. Also accessible by ftp and by gopher.

<URL:ftp://uriacc.uri.edu/davet.195/> (VMS)
Images of the northeast US in GIF format from the afternoon passes of NOAA-11. (Provided by Dave Tetreault, DAVET@uriacc.uri.edu.)

<URL:gopher://ashpool.micro.umn.edu/11/Weather/>
US text forecasts and worldwide satellite images.

<URL:http://grizzly.uwyo.edu/>
<URL:gopher://grizzly.uwyo.edu/>
Weather satellite images and forecast model output, meteorgrams and some forecasts and observations for US states and regions.

<URL:http://www.mit.edu:8001/weather/>
Surface analysis for US, plus (searchable) US city forecasts.

<URL:gopher://gopher.atmos.albany.edu:70/11/local>
National forecasts and discussions, NMC model forecasts, surface maps, state and zone forecasts.

<URL:http://www.nnic.noaa.gov/weather.html>
NWS forecasts and nowcasts for US regions, cities, states.

<URL:http://www.infi.net/weather/>
The Weather Channel home page. General national conditions and links to other sites.

<URL:http://snow.nohrsc.nws.gov>
<URL:ftp://ftp.nohrsc.nws.gov>
National Operational Hydrologic Remote Sensing Center. Various images and animations of snow cover over North America.

<URL:http://www.ems.psu.edu/wx/>
Penn State University Weather Pages. US weather statistics over last 10 days, offshore observations from ships, buoys, and CMAN stations, user-submitted observations. Also connects to the Northeastern US weather page at <URL:http://www.ems.psu.edu/wx/newx.html>.

~Subject: 5) Regional US sites

<URL:http://www2.mry.noaa.gov/nwspage/nwshome.html>
NWS San Francisco Bay. Extensive current weather and forecasts for Northern California, including marine weather and forecasts. Climate data for California cities. Some national weather information, including climate data for about 300 cities nationwide.

<URL:http://apollo.lsc.vsc.edu:70/>
<URL:gopher://apollo.lsc.vsc.edu:70/>
Lyndon State College, VT/Department of Meteorology. McIdas and other weather images, including surface plots, meteograms, upper air plots, satellite images, NGM forecast data for US. Text forecasts, skew-T, and other data for New England.

<URL:http://ats.orst.edu/Weather/>

<URL:ftp://ats.orst.edu/pub/weather/>
GOES IR and VIS images over North and Central America, plus a "floater" image which "could be anything." Also Oregon and US city forecasts, Oregon river and road conditions.

<URL:gopher://mcidas.uncc.edu/>
UNC/Charlotte Earth Science server. MCIDAS and NEXRAD images for the Southeast US, including meteorgrams, mesoscale analyses, upper-air plots, streamlines, divergence, etc.

<URL:http://wwwcaps.uoknor.edu/Weather.html>
Everything you ever wanted to know about weather in Oklahoma

<URL:gopher://vortex.weather.brockport.edu/>
New York State forecasts, Oswego lake effect model output images

<URL:http://www.cs.indiana.edu/weather/bmg.html>
Bloomington, Indiana weather in detail

<URL:http://www.ucar.edu/dss/weather.html>
<URL:ftp://ncardata.ucar.edu/pub/weather/>
Colorado weather forecasts, road conditions, ski conditions

<URL:telnet://empire.cce.cornell.edu>
Weather and climate data and information via Northeast Regional Climate Center's CLIMOD service (login "guest"), select "Weather" then "CLIMOD"

<URL:http://www.ems.psu.edu/wx/newx.html>
Northeastern US Weather Home Page (at Penn State). Satellite images, radar, forecasts, water temperatures, etc.

<URL:telnet://nevado.srcc.lsu.edu>
<URL:gopher://nevado.srcc.lsu.edu>
The Southern Regional Climate Center operates a gopher and telnet site, with data mostly for the states of Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee, and Texas. There is some other US data available through the telnet site (login srcc).

<URL:http://www.hawaii.edu/News/weather.html>
Forecasts and surf conditions in Hawaii

<URL:http://www.cdc.noaa.gov/~cas/boulder.html>
Boulder, CO weather and climate data

<URL:http://www.mrc.uidaho.edu/weather/weather.html>
Idaho current weather information

<URL:http://www.vcnet.com/goldcoastwx/cscalwx.html>
Southern California weather maps, observations, ocean conditions

~Subject: 6) US Regional Climate Centers

<URL:http://climate.sage.dri.edu>
Western RCC

<URL:http://met-www.cit.cornell.edu/nrcc_home.html>
Northeast RCC

<URL:http://sercc.dnr.state.sc.us/sercc.html>
Southeast RCC

<URL:http://maestro.srcc.lsu.edu/srcc.html>
Southern RCC

<URL:http://hpccsun.unl.edu/>
High Plains RCC

~Subject: 7) Global weather in general

<URL:http://www.public.se:80/weather/worldindex.english>
Five-day forecasts for 450 cities worldwide

~Subject: 8) Europe

Most of the European weather information available is limited to satellite images and city observations. Very few European agencies make forecasts available on the Internet.

<URL:ftp://sat.met.ed.ac.uk>
<URL:ftp://liasun3.epfl.ch>
<URL:http://liawww.epfl.ch/weather/weather.html>
University of Edinburgh, and several mirrors, provide IR and visible images of Europe from Meteosat several times daily, in 1152 x 900 Sun raster format (size of Sun root window), gif, and gpeg. The directory "animations" contains movies in .fli and MPEG formats.

<URL:http://typhoon.reading.ac.uk/weather/weather.html>
<URL:ftp://swssner1.reading.ac.uk/pub/images>
University of Reading Department of Meteorology server. Mostly images from other sites collected here, plus animations made from these images. Various satellite images (Meteosat, GMS, GOES), temperature and precipitation images, ozone.

<URL:http://www.ccc.nottingham.ac.uk/pub/sat-images/meteosat.html>

ftp://unicorn.nott.ac.uk/pub/sat-images/
Meteosat images of Europe and North Africa, and the globe, in jpeg format.

<URL:http://www.met.fu-berlin.de/english/Wetter/index.html>
Free University of Berlin Institute for Meteorology. Information is available in German or English. Includes current Berlin weather, latest Meteosat images, list of upcoming conferences, neatly-formatted and organized list of these weather resources.

<URL:http://www.met.fu-berlin.de/deutsch/Wetter/meldungen.html>
Berlin weather (in German)

<URL:http://www.met.fu-berlin.de/extern/Meteofax/index.html>
Forecast and extended forecast for Germany (in German)

<URL:http://www.meteo.fr:80/tpsreel/bulletin.html>
Forecast for France (in French)

<URL:http://www.public.se:80/weather/weatherindex>
Five-day forecast for Sweden (in Swedish)

<URL:gopher://ashpool.micro.umn.edu/11/Weather/Maps>
Meteosat UK, Europe, Scandinavian visible and IR

<URL:gopher://gopher.uni-bayreuth.de:70/11/Service/Meteosat>
Archive of Meteosat images over Europe

<URL:http://wxweb.msu.edu/weather/>
IR, vis images of Europe and N. Africa in gif and jpeg format

<URL:http://web.nexor.co.uk/users/jpo/weather/weather.html>
Images from Nottingham and Edinburgh sites.

<URL:http://www.eso.org/garching-info/computing/weather.html>
Satellite images of Europe

<URL:http://www.telegraph.co.uk>
Synoptic charts for the UK (must register)

~Subject: 9) Australia and New Zealand

<URL:http://www.gphs.vuw.ac.nz/meteorology/maps.html>
<URL:ftp://ftp.gphs.vuw.ac.nz/pub/weather/pictures>
Victoria University of Wellington Geophysics department. GMS images over New Zealand, hourly, in jpeg format, for the last week or so.

<URL:gopher://babel.ho.bom.gov.au/>
Australian Bureau of Meteorology. Weather forecasts, reports, warnings; satellite images and weather charts.

<URL:telnet://vicbeta.vic.bom.gov.au:55555/>
Australian weather observations and forecasts.

<URL:http://www.ml.csiro.au/~lband/index.html>
Latest NOAA AVHRR satellite images of Southern Australia.

<URL:ftp://ftp.jcu.edu.au/JCUMetSat/>
<URL:http://typhoon.reading.ac.uk/weather/aust.html>
<URL:ftp://swssner1.reading.ac.uk/pub/images/aust>
James Cook University. GMS-4 images updated regularly for various Australian states, Australia as a whole, the globe, the TOGA/COARE area, and events of interest such as cyclones. The images are in a format designed for the package JCUMetSat on Amiga computers, but can be converted to GIF format using the ALCHEMY software (shareware) available at this site. (More information on the format and images can be obtained from Professor C.J. Kikkert, eecjk@marlin.jcu.edu.au.)
The University of Reading Department of Meteorology has these images converted to GIF format and also in movie (.fli) version.

~Subject: 10) Asia

<URL:http://hydro.iis.u-tokyo.ac.jp/>
<URL:ftp://hydro.iis.u-tokyo.ac.jp/data/>
GMS and NOAA quick look images of the area around Japan are recieved and processed by Musiake Laboratory in Institute of Industrial Science, University of Tokyo. The images are in a variety of formats.

<URL:gopher://gopher.ncc.go.jp:70/11/INFO/weather/>
GMS and NOAA images of Japan and Pacific, weather forecasts (in Kanji)

<URL:http://www.iohk.com/UserPages/ckfong>
Weather Underground of Hong Kong. Climate of Hong Kong, monthly weather summaries and tropical cyclone reports, latest GMS-5 satellite images, current weather in Hong Kong, and more.

~Subject: 11) South/Central America, Caribbean

<URL:http://www.eso.org/garching-info/computing/weather.html>
Satellite images of South America

<URL:gopher://metlab1.met.fsu.edu:70/11/surface>
Surface plots for Caribbean, Mexico

<URL:http://www.nnic.noaa.gov/weather.html>
NWS observations for Latin America can be obtained by choosing Regional Weather Summary from the "Weather Forecast Product" menu, hitting "Select", and choosing "Latin America". Kind of complicated, but it works.

~Subject: 12) Antarctica

<URL:ftp://bssiaa.nbs.ac.uk/pub/metlog/>
British Antarctic Survey database. Antarctic surface weather conditions and soundings, about a day delay. Information about the contents of this site is in <URL:ftp://bssiaa.nbs.ac.uk/pub/metlog/userguide.html>.

<URL:http://www.awi-bremerhaven.de/MET/Neumayer>
Observations from German Antarctic Station Neumayer (70037'S, 8022'W).

<URL:http://wxweb.msu.edu/weather/antarctica.html>
Antarctica infrared composite image

<URL:http://www.ssec.wisc.edu/data/index.html>
<URL:gopher://gopher.ssec.wisc.edu:70/11/amrc.d>
Southern hemisphere composite images

~Subject: 13) Africa

<URL:http://cirrus.sawb.gov.za>
Current weather and forecasts for South Africa

~Subject: 14) Various satellite data and archives

<URL:http://www.ssec.wisc.edu/data/index.html>
<URL:gopher://gopher.ssec.wisc.edu:70/11/gsdc.d/>.
<URL:ftp://ftp.ssec.wisc.edu/gopher/>
Space Science and Engineering Center, U. of Wisconsin-Madison.
Near real-time daily browse GIF images from GOES series satellites.
Antarctic and global composite images, weekly SST, forecast images,
half-hourly real-time GOES-8 vis, IR, and water vapor images over North
America, some special event images.
For information contact gopher@ssec.wisc.edu

<URL:ftp://photo1.si.edu/More.Smithsonian.Stuff/nasm.planetarium/>
Directory "weather.gif"images from NOAA and Meteor polar orbiting weather
satellites, maybe others. Images will remain here for a few weeks -- some
of the more exceptional images will be placed in a longer-term archive under
the subdirectory "weather.archive".
For more information, contact nasep007@sivm.si.edu (Geoff Chester).

<URL:http://www.sat.dundee.ac.uk/>
<URL:ftp://ftp.sat.dundee.ac.uk/>
Dundee University archive of NOAA AVHRR / HRPT images of Europe for the
last 15 years, with on-line access to lower resolution images (Quicklooks)
for the last six months, and a full resolution data service on request.
For information contact Alan Muir (asm@ua.ndu.ac.uk).

<URL:http://satftp.soest.hawaii.edu/>
<URL:ftp://satftp.soest.hawaii.edu/>
University of Hawaii Satellite Oceanography site. AVHRR images within the
radius of reception of the university's HRPT station, approximately 5 S to
45 N and 125 W to 165 E, and from a station in San Diego. The processed
images are available usually within 30 min. of NOAA-12 passages. GMS
images of the full GMS coverage area and over the TOGA-COARE area are
available.

<URL:ftp://explorer.arc.nasa.gov/pub/Weather/> (for use by west America)
<URL:ftp://boa.gsfc.nasa.gov/Weather/gms/> (for use by east America, Europe)
<URL:ftp://plaza.aarnet.edu.au/Weather> (for use by Australia, NZ, Asia)
Visible and IR hourly GMS-5 images in gif format (neat pictures, may be
enhanced), and in hdf format (raw, intended for research), in the directory
"pub/Weather/GMS-4". Resolution is 5 km so images are 2-3 MB in size.
The hdf files have navigation information included. The "pub/Weather/GOES-7"
directory contains half-hourly visible and IR GOES-7 images in gif and hdf
formats; the IR data is 8 km resolution and the VIS is a very large 4 km
resolution. Also, "pub/Weather/GOES-8" now contains GOES-8 images.
For more information contact medin@cincsac.arc.nasa.gov
(Milo S. Medin).

<URL:gopher://wx.atmos.uiuc.edu:70/11/Images/Satellite%20Images>

Archive: Satellite images from 1993 and 1994

<URL:http://www.bbc.co.uk/john_wxpics/index.html>
Archive: 3-4 weeks of Meteor and NOAA satellite images

<URL:gopher://gopher.uni-bayreuth.de:70/11/Service/Meteosat>
Archive: Meteosat images over Europe

~Subject: 15) Specialty-oriented weather sites

These sites are intended for users with particular interests or background, and include marine forecasts, aviation weather, and forecast products which are more interesting to meteorologists than to lay users.

<URL:http://grads.iges.org/pix/head.html>
Center for Ocean-Land-Atmosphere Studies. Global 10-day temperature and precipitation forecasts, medium-range forecasts, and analyses. A few more products for North America, including current weather images. Images of hurricanes, El Nino forecasts.

<URL:http://java.meteor.wisc.edu/index.html>
University of Wisconsin-Nonhydrostatic Modeling System home page. 48 hour forecast VIS-5D datasets for all three model grids with a one hour animation timestep are available for download. A map outline file and surface topography file for our local spherical coordinate system are also available.
GIF format images of various model quantities are also available at 6 hourly forecast intervals starting at 00 UTC and ending at 00 UTC + 48 hours.
The model is run once every day using the 00 UTC NMC eta analysis, and uses 6 hourly eta model forecasts as boundary conditions. More info on the specifics of the model is available through the home page.

<URL:http://www.fnoc.navy.mil/noraps.html>
Fleet Numerical Meteorology and Oceanography Center. Surface temperature and precipitation, 12-hour precipitation analyses and forecasts. Also see entry under Oceanography in research data section.

<URL:http://www.oceanweather.com/~oceanwx/data.html>
Oceanweather, Inc. current global significant wave height data and observations.

<URL:http://www.navcen.uscg.mil>
<URL:gopher://gopher.navcen.uscg.mil>
<URL:ftp://ftp.navcen.uscg.mil>
U.S. Coast Guard. Maritime safety, GPS, radionavigation, marine weather information.

<URL:telnet://duat2.wtp.gtefsd.com>

Aviation weather -- This service is restricted to pilots only.
Various weather products are available including SA, UA, and severe weather info. Hit '?' for help whenever you are confused by a prompt.
DUATS can also be accessed directly by 1-800-767-9989 at 9600 baud.

<URL:http://acro.harvard.edu/GA/av_weather.html>
Aviation Weather Page. A list of aviation weather information sources.

<URL:telnet://shelley.ca.uky.edu>
<URL:gopher://shelley.ca.uky.edu:70/11/weather>
University of Kentucky College of Agriculture Gopher server.
US Zone forecasts by state, plus detailed forecasts and observations for Kentucky. Also includes river conditions for central US states under the NWS products menu. For telnet access, log in as "kyag".

<URL:gopher://swami.tamu.edu/>
<URL:http://swami.tamu.edu/>
Agricultural weather for Texas, Oklahoma, New Mexico; Palmer drought indices, statistics, weather summaries. Agricultural weather advisories for much of southern US.

<URL:http://agwx.agry.purdue.edu>
The (NOAA/NWS) Midwest Agricultural Weather Center WWW service. Available products include agricultural advisories, impact statments, weather forecasts and climate data for the states of Illinois, Indiana, Kentucky, Michigan, Missouri and Ohio.

~Subject: 16) Severe weather

Current information:

<URL:http://taiga.geog.niu.edu/chaser.html>
Northern Illinois University Storm Chaser homepage. Contains a wealth of information for serious storm chasers, such as soundings, all US and European model forecasts, the "Supercell Index" from the operational version of the University of Wisconsin model, as well as complete current weather information; listings of commercial and amateur radio stations/frequencies and TV stations worth tuning into while chasing; recommend places to eat and sleep; the best road maps, and much more.
You will also find NWS office information, including rules, chaser ethics, and Roger Edwards (SELS) storm chaser report form for reporting severe weather. The latest tornado research can be found linked here to the University of Oklahoma and NSSL, and if you need a chase partner, you can tell others you are looking for one. Plus, information pages on the StormTrack and TESSA (Texas Severe Storms Association) newsletters and organizations can be found here.

<URL:ftp://squall.met.fsu.edu/pub/jack>
Tropical Cyclone Weekly Summary archive. Files are named "tlognnnn.txt" where nnnn is the report number -- the highest report number is the most recent (current).

<URL:http://typhoon.atmos.colostate.edu/forecasts/index.html>
Atlantic Seasonal Hurricane Forecast (current and past) by W. Gray and C. Landsea of Colorado State University.

<URL:http://www.nhc.noaa.gov/>
NOAA's National Hurricane Center. Information about current tropical cyclones, images, storm tracks, facts about hurricanes. Also links to their archive.

<URL:http://www.station.net/~kenf/tcc.html>
Tropical Cyclone Centre (Hong Kong). Tropical cyclone tracks, images, MPEG movies, cyclone names.

<URL:http://grads.iges.org/pix/head.html>
Center for Ocean-Land-Atmosphere Studies. Images and information on current hurricanes and tropical storms.

<URL:gopher://wx.atmos.uiuc.edu:70/11/Hurricane%20Track>
UofI Weather Machine hurricane and tropical storm advisories, tracks, discussion, other information.

<URL:http://www.hawaii.edu/News/storm.tracks.html>
Charts and projections of tropical storm movement in the Atlantic, Pacific, and Indian Ocean areas, updated every six hours.

<URL:http://aws.com/>
Automated Weather Source, Inc. Includes page on lightning and storm chasing, graphs of weather data taken during unusual weather events, information about recent hurricanes and tropical storms.

Archives: Severe weather in general and other natural disasters

<URL:ftp://ftp.nohrsc.nws.gov/pub/Natural.Disasters>.
Images of the east coast during the March 1993 blizzard, of the midwest during the July 1993 flood, and others.

<URL:ftp://climate.gsfc.nasa.gov/pub/gumley/>
Midwest 1993 flood images

<URL:gopher://downwind.sprl.umich.edu/11/Famous_Weather_Events/>
Blizzard of 93, hurricanes Andrew, Hugo, Emily, Elena; tornado paths

<URL:ftp://earthsun.umd.edu/JEI/GOES>
"Blizzard of 93" movie in .flc format

<URL:ftp://sumex-aim.stanford.edu/pub/info-mac/art/qt/>
Quicktime (for Macintosh) movie of "Blizzard of 93"

<URL:ftp://swssner1.reading.ac.uk/pub/images/special>
<URL:http://typhoon.reading.ac.uk/weather/special.html>
Various hurricane and other storm animations in .fli format

<URL:http://www.hvu.nl/flood/>
Reports and information on February 1995 flood in the Netherlands

Archives: Hurricane images, tracks, etc:

<URL:http://www.ngdc.noaa.gov/dmsp/TCYCLONE/weekly.html>
<URL:ftp://ftp.ngdc.noaa.gov/DMSP/SERVICES/WEEKLY/TCYCLONE
Archives of the Tropical Cyclone Weekly summary from 1994.

<URL:ftp://downdry.atmos.colostate.edu/pub/>
Historical tropical cyclone best track data for Atlantic and Pacific.
Also the Tropical Cyclone FAQ by Chris Landsea.

<URL:ftp://ftp.colorado.edu/pub/weather-images/hurricane.andrew>
Images and other information from Hurricanes Andrew and Emily.

<URL:ftp://rainbow.physics.utoronto.ca/pub/sat_images/emily>
Images from Hurricane Emily

<URL:ftp://unidata.ucar.edu/images/archive>
Images of hurricanes Emily, Hugo, Beryl, Kevin

<URL:ftp://ats.orst.edu/pub/weather/>
Hurricane Andrew and Emily images

<URL:ftp://ftp.met.fsu.edu/pub/hurricane_Andrew>
Hurricane Andrew images

<URL:ftp://photo1.si.edu/More.Smithsonian.Stuff/nasm.planetarium/weather.archive>
Gordon, Emily images

<URL:http://satftp.soest.hawaii.edu/fernanda.html>
Hurricane Fernanda images

~Subject: 17) Collections of weather data links

<URL:http://cirrus.sprl.umich.edu/wxnet/>
WeatherNet is a big collection of North American weather links, images, and information.

<URL:http://taiga.geog.niu.edu/welcome.html>
The Meteorology Program at Northern Illinois University's home page has links to other weather pages by protocol (telnet, gopher, ftp, http).

<URL:http://savvy.com/~nexrad/weather.html>
ShareWear Inc. Links to many weather pages.

<URL:http://www.met.fu-berlin.de/DataSources/MetIndex.html>
Free University of Berlin Institute for Meteorology. "The World-Wide Web Virtual Library: Meteorology." A big list of pointers to many of these weather data sources, nicely formatted but with many outdated links.

<URL:http://www.eskimo.com/~jgriffin/weather.html>
Links to many of these meteorological data sources.

<URL:http://www.infi.net/~cwt/wrld-wea.html>
"Virtual Library of Hampton Roads" weather page. Links to weather forecasts, maps, institutions, informational articles.

<URL:http://sci-ed.fit.edu/wx.html>
Florida Tech. Links to several weather pages.

~Subject: 18) Commercial services

<URL:http://mars.jdsoft.com/index.html>
<URL:ftp://mars.jdsoft.com/Lightning/>
JD Software's Lightning! Internet Data Server. Commercial and shareware versions.

<URL:http://www.vcnet.com/goldcoastwx/home.html>
Gold Coast Weather. Internet-based service providing weather and oceanographic information useful in planning ocean-related activities.

Part 3/7
Summary: Research and miscellaneous data available via the Internet

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/research-data
Last-modified: 12 Sep 1995

Recent changes:

==within last two weeks==

==within last four weeks==
Major reorganization
Changed URLs to conform to RFC 1808
Removed dead links
Added <URL:ftp://meds02.met.fu-berlin.de/pub/SEA-ICE/> operational sea ice maps to glaciology section
Added <URL:http://www.giss.nasa.gov/Data/> GISS http server (formerly only ftp server)

If the date in the headers of the document you're reading is more than a month old, you should retrieve a current copy. Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:
Meteorology FAQ Part 1/7: Intro
Meteorology FAQ Part 2/7: Sources of weather data
Meteorology FAQ Part 3/7: Sources of research data <===
Meteorology FAQ Part 4/7: Sources of CD-ROMs
Meteorology FAQ Part 5/7: Internet resources
Meteorology FAQ Part 6/7: Print and other resources
Meteorology FAQ Part 7/7: List of US State Climatologists

Corrections, additions, and comments should be sent to Ilana Stern at ilana@ncar.ucar.edu. Please include in your message where you read this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

Sites listed in this section contain sites with data other than just weather information. This includes map data, miscellaneous images, atmospheric and oceanographic research data, and software for use with meteorological data. Primary data centers are listed first, followed by sites which may have some data of that type but are not necessarily official data centers.

Much of the research data is not free and is not directly available over the network; only metadata, or information about the data, is available, and you must place an order for the actual data.

~Subject: 3) Multidisciplinary Data Centers

<URL:http://gcmd.gsfc.nasa.gov>
<URL:telnet://gcmd.gsfc.nasa.gov> (login "gcdir")
The Global Change Master Directory is a multidisciplinary on-line information system containing descriptions of Earth and space science data holdings available to the science community. These include data from NASA, NOAA, NCAR, USGS, DOE (CDIAC), EPA, NSF and other U.S. and international agencies, universities, and research centers.
For telnet access, login as "gcdir".

<URL:http://www.ucar.edu/dss/index.html>
<URL:ftp://ncardata.ucar.edu>
National Center for Atmospheric Research (NCAR) Data Support Section maintains a large archive of a variety of atmospheric, oceanic, and geophysical datasets, encompassing most subdisciplines. This site contains information (metadata) on available datasets; a few small datasets are directly available.

<URL:http://www.esdim.noaa.gov>
National Oceanic and Atmospheric Administration (NOAA) Environmental Information Services Home Page. This "master page" links to the Web pages of the various NOAA Data Centers:
National Climatic Data Center (NCDC) <URL:http://www.ncdc.noaa.gov/>
National Oceanographic Data Center (NODC) <URL:http://www.nodc.noaa.gov/>
National Geophysical Data Center (NGDC) <URL:http://www.ngdc.noaa.gov/>
You can search the NOAA dataset catalog, which covers all the NOAA Data Centers. The individual data centers are also listed elsewhere in this document.

<URL:http://eos.nasa.gov>
Home page for Earth Observing System (EOS). This "master page" links to the home pages of the various Distributed Active Archive Centers (DAACs), which provide data from EOS:
JPL Physical Oceanography DAAC <URL:http://podaac-www.jpl.nasa.gov>
Marshall Space Flight Center DAAC <URL:http://wwwdaac.msfc.nasa.gov>
Goddard DAAC <URL:http://daac.gsfc.nasa.gov/DAAC_DOCS/gdaac_home.html>
Earth Resources Observation Systems DAAC
<URL:http://sun1.cr.usgs.gov/landdaac/landdaac.html>
National Snow and Ice Data Center DAAC
<URL:http://floeberg.colorado.edu:1733/index.html>
Langley DAAC <URL:http://eosdis.larc.nasa.gov>
Oak Ridge National Laboratory DAAC <URL:http://www-eosdis.ornl.gov>
NOAA's Satellite Active Archive <URL:http://www.saa.noaa.gov>
Consortium for International Earth Science Information Network (CIESIN)
<URL:http://www.ciesin.org>

Alaska Synthetic Aperture Radar (SAR) Facility
<URL:http://eosims.asf.alaska.edu:12355/datacenters_documents/ASF_datacenter_doc.html>
The individual data centers are also listed elsewhere in this document.

<URL:http://nssdc.gsfc.nasa.gov/earth/earth_home.html>
National Space Science Data Center (NSSDC) earth science archive page. A new policy from the Earth Sciences and Applications Division at NASA Headquarters directed NSSDC to distribute its holdings to various designated archives. NSSDC no longer archives any new Earth science data; this site describes the Earth science data transfer activities and provides selective data and resources available to users.

~Subject: 4) Climate and weather

<URL:http://www.ncdc.noaa.gov>
<URL:ftp://ftp.ncdc.noaa.gov/pub/data/>
<URL:telnet://hurricane.ncdc.noaa.gov> (login "storm", password "research")
National Climatic Data Center (NCDC) of NOAA. Inventories and metadata for various climate datasets are available, along with selected datasets. This is a World Data Center A for meteorology.

<URL:http://www.cdc.noaa.gov>
The Climate Diagnostics Center (CDC), previously the Climate Research Division of the ERL Climate Monitoring and Diagnostics Laboratory (CMDL), conducts diagnostic studies of climate variability on time scales of months to centuries. CDC climatological data is archived in netCDF format. This site gives access to metadata (information about these datasets) which can be searched by various keywords; actual data must be ordered from CAC by email or fill-in forms.

<URL:http://nic.fb4.noaa.gov>
<URL:ftp://nic.fb4.noaa.gov/pub/>
Climate Prediction Center. Climate products and services consisting of operational prediction of climate variations, monitoring of the climate system and development of data bases for determining current global and regional climate anomalies and trends, and analysis of their origins and linkages to the complete climate system, including ENSO advisories and indices, and monthly mean and anomaly fields.

<URL:http://daac.gsfc.nasa.gov/DAAC_DOCS/gdaac_home.html>
Goddard Distributed Active Archive Center (DAAC). Data and related services for global change research and education. Data holdings cover information on the upper atmosphere, atmospheric dynamics, and global biosphere.
Products include data from Upper Atmosphere Research Satellite (UARS), Total Ozone Mapping Satellites (TOMS), Coastal Zone Color Scanner (CZCS),

Sea-viewing Wide Field of View Sensor (SeaWiFS), Pathfinder Advanced Very High Resolution (AVHRR) land sensor 4-Dimensional Assimilation dataset, Total Ozone Vertical Sounder (TOVS) Pathfinder data, Tropical Ocean Global Atmosphere (TOGA) Coupled Ocean-Atmosphere Response Experiment (COARE) Field Observation experiment data.

<URL:http://rainbow.ldgo.columbia.edu>
Lamont-Doherty Earth Observatory of Columbia University's Climate Group's server. The "Data Library" contains various climatologies for the ocean and atmosphere, and topographic data, along with a nice interactive system for selection and display of data.

<URL:http://www.giss.nasa.gov/Data/>
<URL:ftp://nasagiss.giss.nasa.gov>
Various monthly mean data files, including ISCCP C2 cloud data, surface temperature anomalies, grids of various variables used in the GCM II (General Circ. Model). Also various maps of vegetation indices, cultivation indices, wetland ecosystems.
The ftp machine can not be accessed using a WWW browser -- you must ftp directly. The file "GISS.HELP" contains an index.

<URL:http://thunder.atms.purdue.edu:80/toga_atlas/>
Climatology of the TOGA-COARE and adjacent regions.

<URL:http://climate.sage.dri.edu>
Western Regional Climate Center

<URL:http://met-www.cit.cornell.edu/nrcc_home.html>
Northeast Regional Climate Center

<URL:http://sercc.dnr.state.sc.us/sercc.html>
Southeast Regional Climate Center

<URL:http://maestro.srcc.lsu.edu/srcc.html>
Southern Regional Climate Center

<URL:http://hpccsun.unl.edu/>
High Plains Regional Climate Center

~Subject: 5) Satellite data

<URL:http://www.saa.noaa.gov>
<URL:telnet://saa.noaa.gov>
NOAA's Satellite Active Archive is a digital library of real-time and historical satellite data from NOAA's Polar-orbiting Operational Environmental Satellites (POES). Currently, AVHRR and TOVS data is available.

<URL:http://eosims.asf.alaska.edu:12355/datacenters_documents/ASF_datacenter_doc.html>
Alaska Synthetic Aperture Radar (SAR) Facility Home Page. SAR images and derived data, AVHRR and Landsat satellite imagery.

<URL:http://www.ngdc.noaa.gov/dmsp/dmsp.html>
<URL:ftp://ftp.ngdc.noaa.gov/DMSP>
Info about, and sample data from the NOAA Defense Meteorological Satellite Program (DMSP). DMSP is a two satellite constellation of near-polar orbiting, sun-synchronous satellites monitoring meteorological, oceanographic and solar-terrestrial physics environments.

<URL:http://jwocky.gsfc.nasa.gov>
Total Ozone Mapping Spectrometer (TOMS) home page. Contains general information on ozone, ozone satellite retrieval, and information about Earth Probe/TOMS, Meteor-3, and Nimbus-7. Ozone movies and graphs also available.
Nimbus-7 and Meteor-3 daily gridded Total Ozone Mapping Spectrometer (TOMS) ozone data is available via <URL:ftp://jwocky.gsfc.nasa.gov/pub/>. user is warned that the data are not archive quality and not suitable for publication. Data will eventually be archived with the GSFC DAAC.

<URL:gopher://diamond.ssec.wisc.edu>
<URL:ftp://diamond.ssec.wisc.edu>
The GOES (Geostationary Operational Environmental Satellite) Pathfinder Data Set was generated at SSEC using full resolution GOES imagery from the Geostationary National Archive. Includes 8 km products, 70 km equal area statistics products, 24 km browse of the 8 km products, and 9 panel browse of the 70 km statistics from May 4, 1987 through November 30, 1988.

<URL:ftp://archive.afit.af.mil/pub/space/>
Two-line element data (TLE) for a variety of satellites.

~Subject: 6) Hydrology and glaciology

<URL:http://wwwdaac.msfc.nasa.gov>
Marshall Space Flight Center Distributed Active Archive Center (MSFC.DAAC). Data holdings are primarily aimed at researchers investigating facets of the hydrologic cycle. Available data includes SSM/I NOAA/NASA Pathfinder Products, TOVS NOAA/NASA Pathfinder Path C1 Products, SSM/I Antenna Temperatures and Sensor Counts, and Climatological Summaries.

<URL:http://floeberg.colorado.edu:1733/index.html>
The National Snow and Ice Data Center Distributed Active Archive Center (NSIDC DAAC) maintains information about snow cover and avalanches, glaciers and ice sheets, floating ice, ground ice and permafrost, atmospheric ice, extra-terrestrial ices, paleoglaciology and ice cores.
Also see the NSIDC home page at <URL:http://nsidc.colorado.edu/>.

<URL:http://www.nohrsc.nws.gov>
<URL:gopher://gopher.nohrsc.nws.gov>
<URL:ftp://ftp.nohrsc.nws.gov/pub>
National Operational Hydrologic Remote Sensing Center. Snow cover measurements in US and Canada, and snow water equivalent data.

<URL:ftp://meds02.met.fu-berlin.de/pub/SEA-ICE/>
The Institute for Meteorology of the Free Uni Berlin provides operation sea-ice maps. Text is mostly in German but there are some English translations.

~Subject: 7) Environmental chemistry

<URL:http://www-eosdis.ornl.gov>
The Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) provides information about the Earth's biogeochemical dynamics (the chemical interactions among the Earth's surface, water, and air that produce changes in the Earth and its climate) to the global change research community, policy makers, educators, and the general interested public.

<URL:http://eosdis.larc.nasa.gov>
<URL:telnet://eosdis.larc.nasa.gov> (login "ims", password "larcims")
The Langley Distributed Active Archive Center (DAAC) archives and distributes radiation budget, cloud, aerosol, and tropospheric chemistry data to the general science community. Data are available via FTP, tape and CD-ROM.
Products include data from the Earth Radiation Budget Experiment (ERBE), Surface Radiation Budget (SRB), International Satellite Cloud Climatology Project (ISCCP), Stratospheric Aerosol and Gas Experiment (SAGE), First ISCCP Regional Experiment (FIRE), and Global Tropospheric Experiment (GTE).

<URL:http://www.epa.gov>
<URL:gopher://gopher.epa.gov>
Environmental Protection Agency. A variety of publicly-accessible databases, including air pollution data, toxic chemical release data, and geographic data.

~Subject: 8) Geophysical and mapping data

<URL:http://www.usgs.gov/data/index.html>
U.S. Geological Survey (USGS) data products, including cartographic data, geologic data, water data, and links to other USGS machines which hold data or metadata archives.

<URL:http://sun1.cr.usgs.gov/eros-home.html>
U.S. Geological Survey's EROS Data Center (EDC). Aerial photography, cartographic data, earth science data, hydrologic data, landuse/landcover data, radar data, satellite and satellite derivative data, topographic data.

<URL:http://sun1.cr.usgs.gov/landdaac/landdaac.html>
Earth Resources Observation Systems (EROS) Data Center Distributed Active Archive Center (EDC.DAAC). Archives include land processes data, including satellite- and aircraft-acquired data: 1km AVHRR, Landsat Pathfinder data, Digital Chart of the World Derived Digital Elevation Model Data (topographical charts), SIR-C/X-SAR (Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar).

<URL:http://www.ngdc.noaa.gov>
<URL:gopher://gopher.ngdc.noaa.gov>
<URL:ftp://ftp.ngdc.noaa.gov/>
The National Geophysical Data Center (NGDC) of NOAA manages environmental data in the fields of solar-terrestrial physics, solid earth geophysics, marine geology and geophysics, paleoclimatology, and glaciology (snow and ice). In each of these fields it also operates a World Data Center (WDC A) discipline center. Data and metadata are available.

<URL:http://www.ucar.edu/dss/geo.html>
National Center for Atmospheric Research (NCAR)'s catalog of geophysical and vegetation datasets. Several of these datasets are directly available via this page.

<URL:http://ageninfo.tamu.edu/apl-us>
<URL:gopher://ageninfo.tamu.edu/11/apl-us>
Shaded relief map of USA generated from 30 arc second DEM dataset.

<URL:ftp://ftp.csn.org/COGS/>

The Computer Oriented Geological Society (COGS) has various mapping-related information, datasets, and software.

<URL:ftp://spectrum.xerox.com/pub/map/>
Various USGS and other uncopyrighted data. Includes USGS DEM and DLG files, land use information, and some software to read these files.

~Subject: 9) Instruments and field experiments

<URL:http://aprf.arl.mil>
<URL:ftp://aprf.arl.mil/pub>
Army Research Laboratory's Atmospheric Profiler Research Facility. Real-time, hour-averaged, qc'd, surface to stratosphere profiles of wind, temperature, and optical/radar turbulence from the Atmospheric Profiler Research Facility, White Sands, New Mexico. Archives back through 1994.
This site is scheduled to close down in September 1996.

<URL:http://www.ofps.ucar.edu/ofpsdmc.html>
<URL:telnet://codiac.ofps.ucar.edu> (login "storm", password "research")
UCAR Office of Field Project Support. A large number of datasets from various field projects and research programs, including CEPEX, GCIP, STORM-FEST, TOGA-COARE, are available via "CODIAC" -- The Cooperative Distributed Interactive Atmospheric Catalog.

<URL:telnet://kuda.atd.ucar.edu> (login "kuda", password "science")
Many types of atmospheric measurements and supporting data from the Persian Gulf region during the Kuwait oil well fires (1991). Inventory includes aircraft measurements of particulates, chemistry, radiation, and state parameters, surface-based meteorological, air quality, and radiation measurements, model output grids, and digital satellite images from NOAA and DMSP polar orbiters.
For more information, contact kudastaff@kuda.atd.ucar.edu

<URL:http://ltpwww.gsfc.nasa.gov/MODIS/MAS/Home.html>
Information about, and data from, the MODIS Airborne Simulator multispectral scanner.

<URL:http://www.amps.gov>
The US Department of Energy's Airborne Multisensor Pod System (AMPS) collects a variety of data from multiple sensors mounted on a modified Lockheed RP-3A. Currently the sensors include Synthetic Aperture Radar (SAR) and MultiSensor Imaging (MSI) pods; Effluent Species Identification (ESI) pod is currently under construction. Information about the AMPS project and data is available.

<URL:http://www.jpl.nasa.gov/sircxsar>
Spaceborne Imaging Radar-C/X-Band Synthetic Aperture Radar (SIR-C/X-SAR) flew on space shuttle Endeavour on two missions in 1994. Images from these flights, and information about the instrument.

~Subject: 10) Oceanography

<URL:http://diu.cms.udel.edu>
<URL:gopher://diu.cms.udel.edu>
OCEANIC, the Ocean Information Center at the University of Delaware, contains information about data collected for the World Ocean Circulation Experiment (WOCE) and the Tropical Oceans and Global Atmosphere Coupled Ocean-Atmosphere Response Experiment (TOGA COARE). In addition OCEANIC has a searchable international research ship schedule database, a searchable directory of names/addresses/e-mail of scientists involved in WOCE, and numerous links to WOCE data facilities and other oceanographic information systems.

<URL:http://www.nodc.noaa.gov>
<URL:gopher://gopher.nodc.noaa.gov/>
National Oceanographic Data Center (NODC) of NOAA. The NODC holds physical, chemical, and biological oceanographic data collected by U.S. Federal agencies, including the Department of Defense (primarily the U.S. Navy); state, and local government agencies; universities and research institutions; and private industry. A large percentage of the oceanographic data held by NODC is of foreign origin.

<URL:http://podaac-www.jpl.nasa.gov>
<URL:ftp://ftppodaac.jpl.nasa.gov>
JPL Physical Oceanography Distributed Active Archive Center (PO.DAAC). Products available from PO.DAAC are largely satellite derived, and include: sea-surface height, surface-wind vector (and sigma-nought), surface-wind speed, surface-wind stress vector, integrated water vapor, atmospheric liquid water, sea-surface temperature, sea-ice extent and concentration, heat flux, and in-situ data as it pertains to satellite data.

<URL:http://www-ccs.ucsd.edu/ccs/about_datazoo.html>
<URL:gopher://gopher-ccs.ucsd.edu:70/11/zoo>
Scripps Institute of Oceanography Center for Coastal Studies (CCS) "Data Zoo". Data collected by various California coastal data collection programs and studies.

<URL:http://geochange.er.usgs.gov/pub/info/holdings.html>
Datasets from the the U.S. Geological Survey Global Change Research Program, an operational arm of the national U.S. Global Change Research Program (USGCRP). Modern average global SST and polar sea ice are available.

<URL:http://www.pmel.noaa.gov>
NOAA's Pacific Marine Environment Laboratory. Interactive access to a selection of ocean climatologies and real-time and historical TAO buoy data.

<URL:http://www-aviso.cls.cnes.fr>
AVISO - TOPEX/POSEIDON Home Page. Information on the French-American TOPEX/POSEIDON satellite mission and the French active archive data center, AVISO/Altimetry. Other information on space oceanography related matters.

<URL:http://ftp.csr.utexas.edu/sst.html>
<URL:ftp://ftp.csr.utexas.edu/pub/sst>
Sea level anomalies are routinely computed using TOPEX/POSEIDON (T/P) Interim Geophysical Data Records (IGDRs) by the University of Texas Center for Space Research (UT/CSR) as soon as the data for a complete 10-day repeat cycle are available, approximately 1 to 2 weeks after the end of a cycle.

<URL:http://www.awi-bremerhaven.de/Atlas/SO/Deckblatt.html>
The Alfred Wegener Institute provides the Hydrographic Atlas of the Southern Ocean.

<URL:http://server.ices.inst.dk>
<URL:ftp://server.ices.inst.dk/dist/ocean>
International Council for the Exploration of the Sea (ICES) server has several PC oceanographic products available, including a list of country codes and ship codes, and inventories of data profiles and research activities. For more information contact ocean@server.ices.inst.dk.

<URL:ftp://atlantic.ocean.fsu.edu/pub/>
East coast tidal heights and winds in "pub/Tidedata", QuickBasic IBM-PC shareware to compute tides and currents in "pub/Tides", Luyten & Stommel oceanographic atlas in "pub/LiveAtlas", and other related items.

<URL:ftp://acoustics.whoi.edu/public/Matlab/oceans>
Woods Hole Oceanographic Institution (WHOI) Ocean Acoustics Lab. Various oceanography-related Matlab stuff.

<URL:http://dutlru8.lr.tudelft.nl>
Delft University of Technology. Sea surface altimetry atlas computed from satellite data, satellite orbit determination, global windspeed and wave height from ERS-2.

<URL:http://www.ems.psu.edu/cgi-bin/wx/offshore.cgi>
Penn State University Offshore Weather Data Page. Offshore weather data from buoys, ships, and CMAN stations. 36-hour archive, updates every 15 minutes.

<URL:http://www.aodc.gov.au/Data_Inventory/table_of_contents.html>
The Australian Oceanographic Data Centre (AODC) maintains a database of mainly temperature and salinity profiles for the Australian Area of Interest (30°N - 80°S; 20°E - 150°W), with limited quantities of in-situ data held outside of this region. Information about the datasets is available on the AODC server.

<URL:http://www.fnoc.navy.mil>
Fleet Numerical Meteorology and Oceanography Center. Interactive image generation of wave height analysis and forecasts, SST analysis and climatology. Information about the models used to generate the images is also available.

<URL:http://www.oceanweather.com/~oceanwx/data.html>
Global current marine observations and significant wave height map.

<URL:http://www.etl.noaa.gov/OTHdata.html>
<URL:ftp://netsrv.wpl.erl.gov/pub/et1/oth/>
NOAA's Environmental Technology Laboratory provides an archive of images of ocean surface wind direction for the North Atlantic Ocean from Over-the-Horizon (OTH) Radar. OTH-B was shut down by the Air Force on 4 April 1995 so there is no current data.

<URL:http://www.rsmas.miami.edu/images.html>
The Remote Sensing Group in the Division of Meteorology and Physical Oceanography of the Rosenstiel School of Marine and Atmospheric Science. Low resolution visible and infrared imagery is collected daily from the NOAA sun-synchronous polar orbiting satellites. Low resolution observations (4 km.) are collected globally while high resolution observations (1 km.) are collected from selected areas of research interest around the globe.

Oceanography pointers and indices:

<URL:http://www.mth.uea.ac.uk/ocean/oceanography.html>
<URL:http://www.esdim.noaa.gov/ocean_page.html>
<URL:http://www.whoi.edu/html/www-servers/oceanography.html>
<URL:http://orpheus.ucsd.edu/sio/inst/index.html>
<URL:http://www.nohrsc.nws.gov/other.html>
<URL:http://orpheus.ucsd.edu/sio/inst/index.html>
<URL:http://www-ccs.ucsd.edu/src_oceanography.html>

~Subject: 11) Miscellaneous data

<URL:http://www.ciesin.org>
Consortium for International Earth Science Information Network (CIESIN). Data about human interactions in global environmental change from many sources.

<URL:http://www.sel.noaa.gov>
<URL:gopher://gopher.sel.noaa.gov>
NOAA's Space Environment Laboratory (SEL) server has information about the Sun and the environment between the Sun and the Earth, including "space weather" and solar images

<URL:ftp://explorer.arc.nasa.gov/pub/SPACE/>
Viking, Magellan, and Voyager data, and various earth-from-space images and information.

<URL:http://ageninfo.tamu.edu/eclipse>
<URL:gopher://ageninfo.tamu.edu/11/eclipse>
MPEG of GOES-7 and GOES-8 images during May 10 1994 eclipse

~Subject: 12) Software and documentation

<URL:http://grads.iges.org/grads/head.html>
<URL:ftp://grads.iges.org>
The Center for Ocean-Land-Atmosphere Studies provides GrADS (Grid Analysis and Display System) software and documentation. GrADS is an interactive desktop tool for the analysis and display of earth science data.

<URL:gopher://140.90.5.206>
Information from the National Weather Service Telecommunication Gateway (NWSTG) of the National Weather Service (NWS), Systems Operations Center, about changes to data formats and transmissions information that has not yet been published in standard source documents, such as NWS manuals, WMO manuals, or other documents or announcements.

<URL:ftp://climate.gsfc.nasa.gov/pub/wiscombe/>
A collection of scientific software written by Warren Wiscombe. Mostly atmospheric radiation-related: Mie code, discrete ordinates radiative transfer code, atmospheric thermodynamics code, and other programs.

<URL:ftp://kaja.gi.alaska.edu/pub/>
The Geophysical Institute at the University of Alaska at Fairbanks archives various radiative transfer and other software. The program uvspec, which calculates diffuse and direct uv and visible fluxes (radiance) and intensities (irradiance) at any altitude, is in <URL:ftp://kaja.gi.alaska.edu/pub/arve/>. <URL:ftp://kaja.gi.alaska.edu/pub/disort/> contains a general n-stream radiative transport equation solver.

<URL:http://www.ucar.edu/dss/softlib/index.html>
<URL:ftp://ncardata.ucar.edu/libraries/>
Various software and utilities, including Skew T log P charting software, GRIB decode software, grid interpolation codes, US standard atmosphere calculation.

<URL:ftp://ftp.met.fsu.edu/pub/>
This FTP site at Florida State University is a repository for public domain software and shareware that is useful to atmospheric scientists.

<URL:ftp://ftp.erc.msstate.edu/pub/griblib.tar.Z>
GRIB decode in C

<URL:ftp://ncardata.ucar.edu/libraries/GRIB/>
GRIB decode in Fortran

<URL:ftp://ftp.ucar.edu/ccm/>
Code for the NCAR/CGD Community Climate Model.

<URL:ftp://oak.oakland.edu/SimTel/msdos/weather/>
wxgrfx41a.zip (shareware version of WeatherGraphix 4.1a, a weather plotting and analysis program) and hurricane tracking software.

<URL:ftp://oak.oakland.edu/pub/hamradio/docs/ne-weather/programs/>
Various weather software for Mac and PC.

<URL:ftp://ftpnssl.nssl.uoknor.edu/pub/skaggs>
Humidity-wind chill-heat index program, sunrise calculation program

<URL:ftp://ftp.geog.ubc.ca/pub/jas.latex.dir>
LaTex Style file for JAS

<URL:http://www.smartpages.com/faqs/sci-data-formats/faq.html>
The FAQ for the Usenet newsgroup sci.data.formats. Includes pointers to format descriptions and software for various data formats, including several which are frequently used in the atmospheric sciences: CDF, netCDF, HDF, GRIB. Also pointers to scientific visualization software.

Part 4/7
Summary: Weather and research data available via CD-ROM

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/cdroms
Last-modified: 12 Sep 1995

Recent changes:

==within last two weeks==

==within last four weeks==
Major reorganization
Removed data center listing (now listed with research data)

If the date in the headers of the document you're reading
is more than a month old, you should retrieve a current copy.
Current copies of this FAQ series can be obtained by anonymous FTP at
<URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or
in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:
- Meteorology FAQ Part 1/7: Intro
- Meteorology FAQ Part 2/7: Sources of weather data
- Meteorology FAQ Part 3/7: Sources of research data
- Meteorology FAQ Part 4/7: Sources of CD-ROMs <===
- Meteorology FAQ Part 5/7: Internet resources
- Meteorology FAQ Part 6/7: Print and other resources
- Meteorology FAQ Part 7/7: List of US State Climatologists

Corrections, additions, and comments should be sent to Ilana Stern at
ilana@ncar.ucar.edu. Please include in your message where you read
this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

CD-ROMs tend to be relatively expensive, but can hold as much as 600 megabytes of data. Prices may be outdated, so be sure to inquire from the provider for current prices. Prices for some discs are not known. Some discs are provided with driving software. Most of the software is for IBM-PC or compatible systems, but some is available for the Macintosh, and, increasingly, for Unix systems.

Some of these listings are not for CD-ROMs, but are for floppies or tapes. These are listed here, rather than in the section on data available on other media, because they have been prepared as a package. For non-prepackaged data requests, see the data centers listed in the FAQ section Meteorology FAQ Part 3/7: Sources of research data.

Commercial sources are flagged as such. Inclusion of a commercial source in this listing does not imply endorsement.

~Subject: 3) Weather data

Climate Change Data ($950, or 595 pounds sterling from UK source):
Monthly 5-degree surface temperature anomaly grids 1854-1990, pressure grids 1873-1990. Monthly world temperature data at about 3500 stations and precipitation data at about 6500 stations, for period of record (long). Retrieval and mapping software included, available for various systems.
Contact: Dr. Phil Jones, Climatic Research Unit, University of East Anglia, Norwich NR4 7TJ United Kingdom. Distributed in North America by Chadwyck-Healey Inc.,1101 King St, Alexandria, VA 22314. 800/752-0515.

World Weather Disc ($295):
Monthly temp, precip, pressure, sunshine data for about 2000 world stations for period of record. Daily weather data at hundreds of US stations. Data for some stations on temp, precip, freeze, drought, soil moisture, wind, storms. Frequency and movement of tropical cyclones.

Contact: Cliff Mass, Dept. of Atmos. Sci. (AK40), University of Washington, Seattle, WA 98195. 206/685-0910.

National Climate Info System Volume 1 ($50):
Monthly temperature, precipitation, Palmer Hydrological Drought Index for 344 climate divisions of US. Data can be viewed in tabular or graphical format. The disc covers the period 1895-1989 and contains 1032 time-series graphs, 4180 maps, and 5400 frames of video animation.
Contact: National Climatic Data Center, Federal Building, Asheville, NC 28801. 704/271-4800, email orders@ncdc.noaa.gov.

SAMSON (Solar and Meteorological Surface Observational Network)
(3 disks, $100 each):
The three CD-ROMs are divided geographically into regions: eastern, central, and western U.S., and contain hourly solar radiation data along with selected meteorological elements for the period 1961-1990. It encompasses 237 NWS stations in the United States, and also includes Guam and Puerto Rico. The dataset includes both observational and modelled data. The hourly solar elements are: Extraterrestrial horizontal and extraterrestrial direct normal radiation; global, diffuse, and direct normal radiation.
Meteorological elements are: Total and opaque sky cover, temperature and dew point, relative humidity, pressure, wind direction and speed, visibility, ceiling height, present weather, precipitable water, aerosol optical depth, snow depth, days since last snowfall, and hourly precipitation.
Contact: National Climatic Data Center, see above.

CLIVUE CD-ROM ($50):
The National Climatic Data Center (NCDC) developed a CD-ROM in support of a museum exhibit which traveled across the U.S. The CD contains a 1,500-station subset of NCDC's nearly 8,000 U.S. daily cooperative stations. The user selects a date and area of the U.S. and the CD-ROM database is queried for stations within the specified domain having data. Then, the system displays daily maximum and minimum temperatures, precipitation, and snowfall for the site. Graphs showing 7 years, 21 years, and the full period of record (varies by station) for the station(s) are available. Visual displays allow users to view trends, variability, and extremes.
Contact: National Climatic Data Center, see above.

International Station Meteorological Climate Summary (ISMCS) 2.0 ($50)
This CD released in August 1992 gives detailed climatological summaries for about 980 locations worldwide. These locations include National Weather Service locations, domestic and overseas Navy and Air Force sites, and selected foreign stations. Limited summaries are also given for an additional almost 5,000 worldwide sites. Tabular or statistical data can be exported to a printer or spreadsheet. Also supports limited mouse capability.
Contact: National Climatic Data Center, see above.

U.S. Navy Marine Climatic Atlas of the World Ver 1.0 ($50):
This CD-ROM includes analysis and display software for climatological averages of atmospheric and oceanographic data. The data are summarized with

user-defined 1 and 5 degree grid areas covering the global marine environment. The summaries are produced using predominately ship data collected between 1854-1969. The major elements include air and sea temperature, dewpoint temperature, scalar wind speed, sea- level pressure, wave height, wind and ocean- current roses. This CD also allows the user to define element intervals (e.g. 5 to 10 knots, 2 degree temperature intervals). Contouring for explicitly user-defined regions and exporting data to a printer or diskette are supported.

Contact: National Climatic Data Center, see above.

Meteosat Images on CD-ROM, 1986 to 1991 (price on request):

One full-disk infra-red image per day (usually at 12h00 UTC), one visible image on day 1 of each month (at the same time as the infra-red image), one water-vapour image on day 1 of each month of 1991 (at the same time as the infra-red and visible image). Images of the snow storm over the East coast of the USA on 12&13 March 1993 (from meteosat-3 at 75 degrees East). Images of Kuwait during the Gulf war. Full-disk Images taken by Meteosat-3 at 75 degrees East at the beginning of March 1993.

Contact: J. Le Ber, Meteosat Data Service, European Space Agency, Robert Bosch Str. 5, D6100 DARMSTADT GERMANY

High Resolution Climatology ($199/variable): *COMMERCIAL* (Floppy disk)

Average monthly climatological values of maximum temperature, minimum temperature, and precipitation for every 1 square km of the conterminous US for the 30-year periods 1951-1980 and 1961-1990. The data are stored as a rectangular matrix for each state. Digitized state and county political boundaries are included and referenced to the climate data sets. The data are in raster form as ASCII or 16-bit binary integers. This dataset is distributed on 5.25" or 3.5" floppy disks.

Contact: ZedX, Inc., P.O. Box 404, Boalsburg, PA 16827-0404. 814/466-2025.

US Summary of Day (4 disks, prices vary): *COMMERCIAL*

NCDC Summary of Day data, USGS streamflow data, retrieval and analysis software.

Contact: Hydrosphere, Inc., 1002 Walnut, Suite 200, Boulder, CO 80302 800/949-4937, 303/443-7839

Atlas of Global Instrumental Climate Data - Version 1.0 ($30):

Color-shaded and contoured images of global gridded instrumental data, with each image simultaneously depicting anomaly maps of surface temperature, sea level pressure, and 500 millibar geopotential heights and percentages of reference period precipitation. Monthly, seasonal, and annual composites are available, in either cylindrical equidistant, or northern and southern hemisphere polar projections. Temperature maps are available from 1854 to 1991, precipitation maps from 1851 to 1989, sea level pressure maps from 1899 to 1991, and 500 mb height maps from 1946 to 1991. All images are GIF files (1024 x 822 pixels, 256 color). Shareware for viewing GIF images is also available on the CD-ROM.

Contact: Frank Keimig, Department of Geology and Geography, Box 35820,

University of Massachusetts, Amherst, MA 01003-5820. 413/545-0659, email frank@climate1.geo.umass.edu

Historical Soviet Daily Snow Depth CD-ROM ($50):
Historical Soviet Daily Snow Depth is based on observations at a series of 284 World Meteorological Organization (WMO) stations throughout the Former Soviet Union. The earliest operational stations began recording snow depth in 1881 and the data continues until 1985. Geographic distribution of stations is primarily in the mid latitudes of Eurasia and correspond to inhabited areas. Stations range from 35 to 75 degrees north latitude and from 20 to 180 degrees west longitude. Stations range in altitude from -15 meters to 2100 meters.
Daily data, as well as NSIDC-generated monthly means, are available on a single CD-ROM containing ASCII data files, extraction software, and data documentation. The source of the data used is the State Hydrometeorological Service in Obninsk, Russia. Data were provided to NSIDC via the Bilateral US-USSR WG-8 Exchange. Production of this CD-ROM was funded by the NOAA Earth Science Data and Information (ESDIM) Initiative through the National Geophysical Data Center (NGDC).
Contact: NSIDC User Services, National Snow and Ice Data Center, CIRES - Campus Box 449, University of Colorado, Boulder, CO 80309-0449. 303/492-6199, FAX 303/492-2468, email: nsidc@kryos.colorado.edu, Omnet: NSIDC.

~Subject: 4) Research data

NMC gridpoint dataset ($150):
Twice daily grids for the Northern Hemisphere at a resolution of about 381 km.
Contact: National Center for Atmospheric Research, PO Box 3000, Boulder, CO 80307. 303/497-1219, email datahelp@ncar.ucar.edu.

National Geophysical Data Center (NGDC) discs:
Various discs available, including: Gulf of Mexico GLORIA data, Geophysics of North America, global ecosystems, global topography, gravity data, solar activity, and more. A catalog and price list are available via gopher or ftp (see part 1).
Contact: NGDC, 325 Broadway E/GC4, Dept. 894, Boulder, CO 80303. 303/497-6958, email info@ngdc.noaa.gov.

Global Ocean Temperature and Salinity (2 discs, $80 each or $124/both)
Temperature and salinity in the world ocean for about 1900-1990, based on all available XBTs, MBTs, BTs, etc.
Contact: National Oceanographic Data Center, NOAA/NESDIS E/OC21, Washington, DC 20235. 202/606-4549.

Global Upper Air Climatic Atlas (GUACA) ($200):
This two-volume CD-ROM set uses a 12-year (1980-1991) 2.5 degree upper air data base obtained from the European Centre for Medium Range Weather

Forecasts (ECMWF). This CD presents upper air statistics for 15 vertical levels in the Northern and Southern Hemisphere for dry bulb and dewpoint temperature, geopotential height, air density, and vector and scalar wind speed. The disc provides access/display software for gridpoint data, contouring capability for user-defined areas, and vertical profiles. The climatology covers the 12-year period as well as individual year-months.
Contact: National Climatic Data Center, Federal Building, Asheville, NC 28801. 704/271-4800, email orders@ncdc.noaa.gov.

Radiosonde Data of North America 1946-1992. ($400):
Contains all available radiosonde data for North America (U.S., Canada, Mexico, and Caribbean Islands) through the 100-mb level on four disks. Disk periods are 1946-1965, 1966-1979, 1980-1989, and 1990-1992. Data includes significant, mandatory, and special wind levels for all observation times and includes geopotential height, temperature, dew point and wind direction, and scalar speed. The user can select for output to printer, screen, or file, a single station or multiple stations for a defined time period, or all stations within a specified geographic region in either synoptic or station sort. The CD also contains available station metadata.
Contact: National Climatic Data Center, see above.

Global Tropical and Extratropical Cyclone Climatic Atlas (GTECCA) ($100):
This CD-ROM contains all global historic tropical storm track data available for five tropical storm basins. Periods of record varies for each basin, with the beginning as early as the 1870s and with 1992 at the latest year. Northern hemispheric extratropical storm track data will be included from 1965 to 1992. Tropical track data includes time, position, storm stage (maximum wind, central pressure when available). The user can display tracks, track data for any basin or user-selected geographic area, or tracks passing within a user-defined radius of any point. Narratives for all tropical storms for the 1980-1992 period will be included as well as basin-wide tropical storm climatological statistics.
Contact: National Climatic Data Center, see above.

Global Daily Summary (GDS) ($100):
This CD-ROM provides access to a 10,000-station set of daily maximum/minimum temperature, daily precipitation, and 3-hourly present weather for the 1977-1991 period of record. Data can be selected for viewing or output to file for geographic areas or by a predefined user-selected list of stations. The dataset includes element flags for suspected erroneous data. A data inventory contains station name, latitude/longitude, elevation, period of record, and the number of observations of available data. Requires a bare minimum of 4 MB of RAM, with 8MB of RAM recommended for superior performance.
Contact: National Climatic Data Center, see above.

GALE dataset (price not known):
GALE (Genesis of Atlantic Lows), 1/15/86-4/15/86: ship data, raobs, aircraft, radar, etc off N Carolina coast. Available through Dept. of Atmos. Sci. (AK40), University of Washington, Seattle, WA 98195.

ERICA dataset ($35):
ERICA (Experiment on Rapidly Intensifying Cyclones over the Atlantic), 12/1/88-2/26/89: rawinsondes, aircraft, radar, buoys, satellite data, etc.
Contact: C. Kreitzberg, Dept. of Physics and Atmospheric Science, Philadelphia, PA 19104. (215) 895-2726, kreitzcw@dunx1.ocs.drexel.edu.

GEDEX (Greenhouse Effect Detection Experiment)(price not known):
Two discs containing surface, upper air, and/or satellite-derived measurements of temperature, solar irradiance, clouds, greenhouse gases, fluxes, albedo, aerosols, ozone, and water vapor, along with Southern Oscillation Indices and Quasi-Biennial Oscillation statistics. Many of the data sets provide global coverage. The spatial resolutions vary from zonal to 2.5 degree grids. Some surface station data sets span more than 100 years; most satellite-derived sets cover only the past 12 years. Temporal coverage is monthly for most sets. An update will be available by June 1992.
Contact: NCDS/Goddard Distributed Active Archive Center, Code 935, Goddard Space Flight Center, Greenbelt, MD 20771. 301/286-3209, email NCDSUSO@NSSDCA.GSFC.NASA.GOV.
A more complete description of these discs may be obtained from the ncardata.ucar.edu FTP site, in the file "catalogs/nondss/gedex".

HCDN (Hydro-climatic data network) streamflow dataset (price not known):
Contains dataset, search software, and USGS Open-File Report 92-129 (Slack, J.R., and Landwehr, J.M., 1992, Hydro-climatic data network (HCDN): A U.S. Geological Survey streamflow data set for the United States for the study of climate variations, 1874-1988).
Contact: USGS, National Water Data Exchange (NAWDEX), MS 421 - National Center, Reston VA 22092.
The principal author of this dataset, James R. Slack, can be reached via email at jrslack@qvarsa.er.usgs.gov.
The information on the CD-ROM is also available via anonymous FTP from srv1rvares.er.usgs.gov in the directory "hcdn92".

The following 6 discs/disc sets are available from NSIDC User Services, National Snow and Ice Data Center, CIRES - Campus Box 449, University of Colorado, Boulder, CO 80309-0449. 303/492-6199, FAX 303/492-2468, email: nsidc@kryos.colorado.edu, Omnet: NSIDC.

DMSP F8 Special Sensor Microwave/Imager (SSM/I) Brightness Temperature Grids for the Polar Regions (Price on request):
18 CD-ROM discs contain daily gridded brightness temperature (Tb) for the north and south polar regions (areas where sea ice occurs), on polar stereographic grids, 9 July 1987 through 31 December 1991. Each CD-ROM contains approximately 3 months of data. Defense Meteorological Satellite Program (DMSP) F8 platform carried this first functional SSM/I instrument. The SSM/I is a 7-channel, 4-frequency, linearly polarized, passive microwave radiometric system; channels are 85.5 GHz Vertical/Horizontal, 37.0 GHz Vertical/Horizontal, 22.2 GHz Vertical, 19.3 GHz Vertical/Horizontal.
Fortran program provided on diskette to extract single channel from

inter-leaved storage format. Images can be displayed using IDL or other Unix or PC software. For 1992 and later data, see DMSP F11 SSM/I Brightness Temperature Grids for the Polar Regions, below.

Contact NSIDC, information above.

DMSP F8 Special Sensor Microwave/Imager (SSM/I) Sea Ice Concentration Grids for the Polar Regions 1987 - 1991. (Price on request):

DMSP F8 SSM/I Ice Concentration Grids for the Polar Regions consist of daily first-year, multi-year, and total ice concentration on 25 x 25 km polar stereographic grids for north and south polar regions. SSM/I sea ice CD-ROMs contain two sets of grids, 1) NASA Team algorithm; 2) J.C. Comiso algorithm. Orbital antenna temperatures are processed to gridded brightness temperatures and then used to derive gridded ice concentrations. The SSM/I sensor flies on U.S. Air Force Defense Meteorological Satellite Program (DMSP) platforms; the first operational SSM/I (Special Sensor Microwave/Imager) was that on DMSP F8. Two CD-ROMs contain all F8 SSM/I ice concentrations, 9 July 1987 - 31 December 1991. North polar files are 137202 bytes, south polar are 105922 bytes.

Data are in HDF format and can be read using software from the National Center for Supercomputing Applications (NSCA), available by anonymous ftp from NCSA (ftp.ncsa.uiuc.edu) or with commercial packages such as IDL.

The SSM/I is a 7-channel, 4-frequency, linearly polarized, passive microwave radiometric system: 85.5 GHz Vertical/Horizontal, 37.0 GHz Vertical/Horizontal, 22.2 GHz Vertical, 19.3 GHz Vertical/Horizontal. DMSP F11 SSM/I ice concentrations for 1992 and later dates will be produced starting in late 1994, after the ice algorithms have been modified for F11 data.

Contact NSIDC, information above.

DMSP F11 Special Sensor Microwave/Imager (SSM/I) Brightness Temperature Grids for the Polar Regions. (Price on request):

CD-ROM discs contain daily gridded brightness temperature (Tb) for the north and south polar regions (areas where sea ice occurs), on polar stereographic grids, beginning on 3 December 1991. Each CD-ROM contains approximately 3 months of data in single-channel files, in HDF (Hierarchical Data Format). As of 8/94, 5 volumes cover 12/91 - 2/93. Inquire for latest available data.

Software to read and manipulate the data in HDF is available via ftp from National Center for Supercomputing Applications (NCSA): ftp to ftp.ncsa.uiuc.edu; help is available from NCSA at helphdf@ncsa.uiuc.edu. Data can also be displayed and manipulated using commercial packages such as IDL.

The Defense Meteorological Satellite Program (DMSP) F11 platform carries this SSM/I instrument, a 7-channel, 4-frequency, linearly polarized, passive microwave radiometric system; channels are 85.5 GHz Vertical/Horizontal, 37.0 GHz Vertical/Horizontal, 22.2 GHz Vertical, 19.3 GHz Vertical/Horizontal. This product uses the same grid and projection as the NSIDC DMSP F8 SSM/I brightness temperature and sea ice concentration CD-ROMs (1987 - 1991, see above).

Contact NSIDC, information above.

Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) Polar Radiances and Arctic and Antarctic Sea Ice Concentrations, 1978 - 1987. (Price on request):

Scanning Multichannel Microwave Radiometer (SMMR) Polar Radiances and Sea Ice Concentrations on CD-ROM contain gridded brightness temperatures (Tb) and sea ice concentrations for 10/78 - 8/87 (the life of the Nimbus-7 SMMR scanner) for both polar regions on 12 CD-ROMs. Data were collected at 6.60, 10.69, 18.00, 21.00 and 37.00 GHz in an alternate-day operating pattern due to spacecraft power limitations. [NOTE: Input data set is SMMR TCT tapes; this is different from the previous SMMR CD-ROM product distributed by NSIDC in 1989.] Tb (in Kelvins) and sea ice concentration (in percent) grids have 25 x 25 km grid elements in polar stereographic projection. Volume 7 contains all SMMR sea ice concentrations for both polar regions, plus 5 months of Tb grids for the north polar region. The Tb grids are stored as 16-bit integers; one day of Tb data is 0.27 mbytes for the north polar region, 0.21 mbytes for the south. Ice grids are stored as 8-bit integers, each file = 136192 bytes for the north, 104912 bytes for the south. The NASA Team Algorithm (Cavalieri et al., 1984; Gloersen and Cavalieri, 1986) was used to calculate ice concentrations from the Tbs. Data produced by Dr. P. Gloersen, NASA/GSFC, Oceans and Ice Branch.

Documentation is provided on the CD-ROMs, in a hard-copy User's Guide, and in the "SMMR Atlas", NASA Special Report SP-511 (Gloersen, et al., 1992.)

Contact NSIDC, information above.

Historical Arctic Rawinsonde Archive (HARA), 1947-1987. (Price on request):

The Historical Arctic Rawisonde Archive on CD-ROM, volumes 1-3, contains over 1.2 million vertical soundings of temperature, pressure, humidity, and wind, representing all available rawisonde ascents from Arctic land stations poleward of 65 degrees North from the beginning of record through 1987. For most stations the record begins in 1958, a few begin in 1947 or 1948. The data are one file per year per station. Coverage is relatively uniform, except in the interior of Greenland. Typically 20-40 levels are available in each sounding.

Documentation is provided on the CD-ROM volumes, and in hard copy (NSIDC Special Report 2, 1992). Software (Fortran and C) is provided on the CD-ROM volumes to retrieve a subset of the sounding data.

Data for 1988-1990, and monthly averaged data, will be distributed in late 1994. Sounding data were obtained from the National Center for Atmospheric Research (NCAR), Boulder, Colorado and the National Climatic Data Center (NCDC) of NOAA in Asheville, North Carolina. Data from drifting ice islands, ships and aircraft dropsondes are being assembled as a separate archive.

Contact NSIDC, information above.

Eastern Arctic Ice, Ocean and Atmosphere Data, Volume 1, CEAREX-1 ($50):

Contains sea ice acceleration, deformation and stress; hydrography (CTDs); meteorology; bathymetry; acoustics and ambient noise (sample data) from Coordinated Eastern Arctic Experiment (CEAREX). Includes meteorology from Marginal Ice Zone Experiment (MIZEX), 1983, 1984, 1987. Experiment location: Arctic Ocean north of Svalbard; Fram Strait, September 1988 - May 1989. Amount of data: 460 mbytes.

Data format: ASCII files. Associated software: none. Additional volumes are planned; content not yet determined.
Contact NSIDC, information above.

NWS/NOHRSC snow cover data ($50 each year):
Airborne snow water equivalent and satellite areal extent of snow cover data for 1990-1993 are now available on CD-ROM for major portions of the U.S., Alaska, and Canada. The CD-ROMs include: (1) airborne snow water equivalent data and the digitized flight line network, (2) calibrated AVHRR and GOES satellite data used to map snow cover, (3) the classified snow cover images (4) national and regional snow cover image products, and (5) ancillary data sets including digital elevation data, digitized NWS basin boundaries, and the alphanumeric results of the satellite snow cover mapping by basin and by elevation zone.
Contact: CD-ROM Snow Cover Data, National Operational Hydrologic Remote Sensing Center (NOHRSC), National Weather Service, NOAA,
1735 Lake Drive West, Chanhassen, Minnesota 55317-8582
612/361-6610, FAX 612/361-6634, email tim@snow.nohrsc.nws.gov (Tim Szeliga)
dial-up bbs 612/361-6632

STORM-FEST data (3 discs, price unknown):
Data from the STORM-FEST experiment -- surface observations and rawinsonde, satellite, radar, NOWRAD, and profiler data -- plus Zeb software for viewing the data.
Contact Steve Williams, sfw@ncar.ucar.edu.

AVHRR monthly global MCSST / CZCS data (5 discs, price on request)
The AVHRR MCSST and CZCS phytoplankton pigment concentration data set contains monthly averaged sea-surface temperatures (day and night) derived from NOAA satellite AVHRR which are temporally and spatially coregistered with phytoplankton pigment concentration data acquired from the CZCS instrument on Nimbus-7. The CZCS data cover 1978-1986 and AVHRR data cover the period from 1981-1986, giving 5 years of coregistered data.
Contact: PO.DAAC at JPL. Contact the User Services Office at podaac@podaac.jpl.nasa.gov for more details.

TOPEX/Poseidon altimeter merged geophysical data record (Price on request)
Global coverage data from the TOPEX/POSEIDON mission from both the U.S. and French altimeters with high precision orbits and environmental corrections. The data are distributed on CD-ROMs (ISO 9660) and in an integer format usable on VAX, UNIX, PCs, and Macs. Each CD-ROM contains two ten-day cycles of data, precision orbit, and cross-over files for each cycle and read software for VAX and UNIX. As of May '94 cycles 1-52 exist on CD-ROM.
Contact: PO.DAAC, information above.

TOGA related satellite and in-situ data CD-ROM '85-'90. (Price on request).
PO.DAAC has produced a set of seven CD-ROMs which contain satellite, in-situ, and model derived data pertaining to atmospheric and oceanographic parameters. Parameters include ocean currents, sea-surface temperature and salinity, air temperature and pressure, cloud, and precipitation. Software will

be included. The data have been provided by agencies worldwide. (Available in June '94.)
Contact: PO.DAAC, information above.

Software atlas and plotting tool for oceanographic sections (diskettes)
ATLAST, a PC software atlas and plotting tool for oceanographic sections (Rhines) OCEANATLAS, a Macintosh software atlas and plotting tool for oceanographic sections (Swift et al.) are available on diskettes.
Contact: PO.DAAC, information above.

TOGA/COARE GMS-4 images (2 discs, $75 for the set):
GMS-4 images during the TOGA/COARE Intensive Observation Period (November 1992 to March 1993) regridded over 135E - 175E, 10S - 10N, 5km square pixel size. 1910 infrared and 877 visible images of albedo and brightness temperature with overlays of the geographic grid and the positions of moorings and ships. Images are in compressed PostScript format but tools are included to uncompress and convert the data into other formats.
Contact: Satellite Oceanography Laboratory, University of Hawaii, 1000 Pope Road, Honolulu, HI 96822. The check should be made to the order of "RCUH".

Surface Radiation Budget (SRB) Global Datasets (price not known):
Contains Version 1.1 SRB shortwave products for the period March 1985 through December 1988 as produced by the World Climate Research Programme's (WCRP) SRB Satellite Data Analysis Center (SDAC). Inputs to the Version 1.1 product are results from the International Satellite Cloud Climatology Project (ISCCP) and the Earth Radiation Budget Experiment (ERBE). SDAC uses two methods (known as the Pinker and Staylor algorithms) to estimate surface downward and net irradiances, surface albedo, downward direct/diffuse ratio, surface cloud forcing, and daylight cloud fraction. In addition, various other radiation, cloud, meteorological and diagnostic parameters are provided to aid the user in understanding variations in the SRB parameters.
The SRB CD-ROM has been formatted and produced to work with IBM PCs, Apple Macintoshes and Unix systems with ISO-9660 CD-ROM driver support. In addition, read and display software for IBM PCs and Apple Macintoshes are available upon request.
Contact: Langley DAAC User Services, MS 157B, NASA Langley Research Center, Hampton, VA, 23681-0001. (804)864-8656, userserv@eosdis.larc.nasa.gov

United Kindom Digital Marine Atlas V2.0 (UKP56.40): (Floppy disk)
This is an IBM compatibile PC based Marine Atlas covering the Northeast Atlantic and mainly centered on the British Isles. It comes on five 1.4MB floppies and runs under DOS (V3.0 or higher). It has several sections covering areas such as general Bathymetry, Marine Geology, Marine and Coastal Nature Conservation in Breat Britain, Marine Biology, Physical Oceanography, Marine Chemistry, Fisheries and the BODC data catalogues amongst others.

Contact: UKDMAP Project Manager, British Oceanographic Data Centre, Proudman Oceanographic Laboratory, Bidston Observatory, BIRKENHEAD, Merseyside L43 7RA United Kingdom. +44 51 653 8633, Fax: +44 51 652 3950.

Stratospheric Ozone ($39.95, $49.95 beginning March 1 1995) *COMMERCIAL*
This is a multimedia CD-ROM for the Apple Macintosh from Lenticular Press (College Station, TX). It includes the huge Nimbus 7 TOMS database of stratospheric ozone measurements; global and hemispheric daily, monthly, and climatological maps, and numerical data for the entire 14.5-year record, more than 16,000 maps and 500 MB of data in all.
Contact: Lenticular Press, P.O. Box 10413, College Station, TX 77842-0413. 409/693-0622, 409/693-0729 fax, sales@lenticular.com.

~Subject: 5) Miscellaneous

NASA discs:
Various discs available, including: Voyager spacecraft images (12 discs, under $20 each!), Viking images of Mars, Magellan Venus data, Halley's comet data (25 discs), excerpts from astronomical catalogs, and more.
Contact: NSSDC (NASA Space Science Data Center), Code 933.4, NASA Goddard Space Flight Center, Greenbelt, MD 20771. 301/286-6695. They also publish a free newsletter.

CD-ROM, INC:*COMMERCIAL*
Several hundred discs available, including: "GRIPS 2" high resolution images of topography, Landsat, vegetation maps, plus software ($49), "JEDI" 3 discs full of earth, space, and sea science data intended for school use ($31), 13 business/economic discs, >50 literature and entertainment discs, >40 health-related discs, many science discs. Prices range from $29-$895. Free catalog available from them.
Contact: CD-ROM, Inc, 1667 Cole Blvd. Suite 400, Golden, CO 80401. 303/526-7600, FAX 303/231-9581.

Digital Chart of the World ($200):
The Digital Chart of the World (DCW) is a comprehensive 1:1,000,000-scale vector basemap of the world containing cartographic, attribute, and textual data. It is provided with software that permits the database to be accessed, queried, and displayed on PC-class computers. The primary source for the database is the U.S. Defense Mapping Agency (DMA) Operational Navigation Chart (ONC) series.
There are 4 discs: (1)North America, (2)Europe/Northern Asia, (3)South American/Africa/Antarctica, and (4)Southern Asia/Australia. The data are organized into 17 thematic coverages, including political boundaries and ocean coast lines, cities, transportation networks, drainage, land cover, and elevation contours.
Contact: USGS Open File Section, Box 25286, Denver, CO 80225. 303/236-7476.

GOES Space Environment Data (price unknown):
This disk includes data from January 1986 - April 1994 in 1-minute and 5-minute averages. Includes measurements of the 3 components of the Earth's magnetic field, whole-sun X-ray fluxes for the 0.5-to-4.0 and 1-to-8 Angstrom wavelength bands, photon, alpha particle, and electron fluxes.
The CD-ROM includes software to display and analyze the Space Environment Monitor data. DOS and IDL (Interactive Data Language) versions of the software allow the use of data on many platforms.
Contact: Solar-Terrestrial Physics Division, National Geophysical Data Center, NOAA Code E/GC2, 325 Broadway, Boulder, CO 80303. 303/497-6761, fax 303/497-6513, email goes@farpoint.ngdc.noaa.gov.

Windows on the Weather (price unknown):
This is an educational disc which allows the user to explore typical airmasses over Britain using satellite sequences, weather charts, weather data, pictures, diagrams, text and audio descriptions. Samples from this disc can be seen at:
http://www.rmplc.co.uk/eduweb/sites/advunit/wow.html
Contact: The Advisory Unit computers inEducation, 126 Great North Road, Hatfield Herts, AL9 5JZ UK, email advunit@rmplc.co.uk

Part 5/7
Summary: Mailing lists, newsgroups, institutional home pages etc.

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/net-resources
Last-modified: 12 Sep 1995

Recent changes:

==within last two weeks==
Added AMS gopher <URL:gopher://atm.geo.nsf.gov/11/AMS> to home page list
Added AGU <URL:http://www.agu.org> to home page list
Added AGU science articles <URL:http://www.agu.org/everyone.html> to information on meteorology topics list

==within last four weeks==
Major reorganization
Changed URLs to conform to RFC 1808
Removed dead links
Mailing lists have been alphabetized
Added PCMDI <URL:http://www-pcmdi.llnl.gov/> to home page list
Changed CIRA home page to <URL:http://www.cira.colostate.edu>
Added International Weather Watchers <URL:http://groundhog.sprl.umich.edu/IWW/> to home page list
Added British Antarctic Survey <URL:http://www.nerc-bas.ac.uk/> to home page list

If the date in the headers of the document you're reading is more than a month old, you should retrieve a current copy.
Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:
Meteorology FAQ Part 1/7: Intro
Meteorology FAQ Part 2/7: Sources of weather data
Meteorology FAQ Part 3/7: Sources of research data
Meteorology FAQ Part 4/7: Sources of CD-ROMs
Meteorology FAQ Part 5/7: Internet resources <===
Meteorology FAQ Part 6/7: Print and other resources
Meteorology FAQ Part 7/7: List of US State Climatologists

Corrections, additions, and comments should be sent to Ilana Stern at ilana@ncar.ucar.edu. Please include in your message where you read this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

This is a list of Internet resources for people wishing to discuss or learn about meteorology, climatology, oceanography, and related disciplines. They include resources for laypersons, professionals, teachers, and students.

~Subject: 3) Newsgroups

<URL:news:sci.geo.meteorology>
General discussion of meteorology; current and historic weather phenomena, hurricanes, ENSO, and so on.

<URL:news:sci.geo.fluids>
Discussion of geophysical fluid dynamics.

<URL:news:sci.geo.oceanography>
General discussion of oceanography, including but not limited to physical oceanography.

<URL:news:sci.data.formats>
Discussion of data formats used in the sciences, including meteorology.

<URL:news:sci.geo.geology>

General discussion of geology; earthquakes, formations, and so on.

<URL:news:comp.infosystems.gis>
Discussion of Geographic Information Systems.

<URL:news:sci.nonlinear>
Discussion of chaos, nonlinear systems.

<URL:news:sci.environment>
Discussion of global warming, ozone depletion, anthropogenic effects, social impacts, ecology, and so on. In practice, barely distinguishable from talk.environment.

<URL:news:sci.image.processing>
Discussion of image processing.

<URL:news:talk.environment>
Ranting and raving about global warming, ozone depletion, anthropogenic effects, social impacts, ecology, and so on.

<URL:news:ne.weather>
Discussion of weather in the Northeastern United States (particularly New England).

~Subject: 4) Mailing lists

In the following list of mailing lists, commands to mailservers are set off using quotation marks ("example"). Don't use the quotes when sending actual mail to the servers.

AHP_ARCHIVE-L
A mailing list has been created to discuss issues arising out of the preservation of the archives of the Alberta Hail Project (AHP). The Alberta Hail Project operated from 1957-1986, and collected meteorological data (centered around hail storms) using several sensors, including a circularly polarized 10 cm radar, a co-located 3 cm radar, and an instrumented aircraft, as well as extensive ground operations and surveys.
A project is currently underway to move as much digital data as possible to CD-ROM and store those at the University of Alberta Data Library. For more information on the project or the archives, email johnson@arc.ab.ca or see <URL:http://saturn.arc.ab.ca/~johnson/ahp_archive.html>.
To subscribe, send a message containing the line "SUBSCRIBE AHP_ARCHIVE-L" to MAILSERVE@ARC.AB.CA.
For information on how to use the list, send a mail message to MAILSERV@ARC.AB.CA with one line containing "HELP". To get a list of the addresses on the list, send a message to MAILSERV@ARC.AB.CA containing "SEND/LIST AHP_ARCHIVE-L"

CALMET (Computer Aided Learning in Meteorology)

CALMET is a mailing list dedicated to computer-aided learning in meteorology. It is associated with the ftp site cumulus.met.ed.ac.uk.

To join the list, send mail to calmet-request@ed.ac.uk. Messages to the list go to calmet@ed.ac.uk.

CLIMAT

CLIMAT data are the monthly means produced by the country in which the station is located. CLIMAT station data are exchanged over the Global Telecommunications System (GTS) shortly after the end of the month. This mailing list is for users of CLIMAT data to post error messages and other information.

To subscribe to the CLIMAT data users list, send an email message to almanac@awis.auburn.edu with any subject line and the command "subscribe climat" in the body of the message.

To post a message to all climat subscribers, send it to climat@awis.auburn.edu.

Note that this mailing list is *not* a general discussion list about climate, but is meant for discussion of the CLIMAT data product.

CLIMLIST (moderated by John Arnfield)

CLIMLIST is a moderated electronic mail distribution list for climatologists and those working in closely-related fields. It is used to disseminate notices regarding conferences and workshops, data availability, calls for papers, positions available etc, as well as requests for information. An updated directory of email addresses for the subscribers to the list is distributed every month (usually on the 15th).

To subscribe, mail to whichever of these addresses works for you:

AJA+@OHSTMAIL.BITNET / aja+@osu.edu / johna@magnus.acs.ohio-state.edu

with the following information:

Your name; your email address; your departmental & institutional affiliation; whether your email address is shared or personal; your area of interest or responsibility within climatology.

DMSPINFO (administered by Greg Deuel, gbd@ngdc.noaa.gov)

NGDC provides a mail list server to which those interested in the products of the Defense Meteorological Satellite Program may subscribe. Once added to the list subscribers will be able to receive any notices posted by the DMSP archive and be able to write to and receive information from the archive and other interested users. It is intented to be a forum for interested parties to exhange information on DMSP data, applications and the archive. To subscribe to DMSPINFO, mail listproc@ngdc.noaa.gov with "subscribe DMSPINFO <your name>" in the body.

For general info or help on the list server, mail listproc@ngdc.noaa.gov with the message "help".

GT-ATMDC (coordinated by Ivo Bouwmans, Bouwmans@Interduct.TUDelft.NL)

This is the 'Theme Group' on Atmospheric Dispersion of Chemicals of the Global Research Network on Sustainable Development. Discussions cover:

sources of chemicals and their emission characteristics, the way chemicals disappear from the atmosphere, the atmospheric velocity field and the physical dispersion mechanisms, interaction between the physics and the chemistry of the dispersion process, the effects that chemicals have on the atmospheric system, interaction between the atmosphere and the compartments water and land, selection of consensus models.

This is part of the Global Research Network on Sustainable Development (GRNSD), a worldwide, independent forum of individual scientists. The network will facilitate the international, interdisciplinary, and interactive coordination of the global sustainable development research process.

[More information about GRNSD will be sent after registration or on request.]

To become a member of GT-ATMDC, you must fill out a form describing your contact information, affiliation and research interests. To get the registration form, and more information about the mailing list, send email to Request@Interduct.TUDelft.NL with the subject "send gt-atmdc-info".

HHNet

The goal of HHNet is to promote communication between scientists interested in hydrology. It will generate a regular newsletter called the 'HHNet Digest' for announcements and scientific queries of general interest, provide a central site for obtaining current e-mail addresses of those working in these areas, and diffuse information such as data, information on meetings and seminars, details of new books and journal articles, and vacant faculty positions.

Submissions for Hydro Digest: E-mail to ezzedine@cig.ensmp.fr with "submit" as subject.

Subscriptions for Hydro Digest: E-mail to ezzedine@cig.ensmp.fr with "subscribe" as subject. To unsubscribe, e-mail with "unsubscribe" followed by your e-mail address as subject.

MET-AI (administered by Eric.Jones@comp.vuw.ac.nz)

MET-AI is an unmoderated mailing list for meteorologists and AI researchers interested in applications of artificial intelligence to meteorology. Suitable topics for discussion include (but are not limited to): applications of machine learning to weather forecasting, artificial neural networks in meteorology, automatic interpretation and analysis of satellite imagery, automatic synthesis of weather forecast texts, case-based reasoning and meteorology, expert systems and decision aids for weather forecasting, high-level interfaces to archives of meteorological data, and statistical pattern recognition

To subscribe to MET-AI, send e-mail to met-ai-request@comp.vuw.ac.nz, including the command "subscribe" in the body of your message.

MET-JOBS (administered by ted.smith@mtnswest.com)

MET-JOBS is for posts of employment opportunity announcements in meteorology, climatology, and other atmospheric sciences. Announcements of teaching or research graduate assistantships, postdoctoral research positions, etc., also are appropriate. Any employment setting (academia, government, or private industry) located anywhere in the world is appropriate.

*** DO NOT *** post resumes, inquiries, responses to job opportunity posts, etc., to this list. Persons who do so may be removed from the list.

There is also a GEOSCI-JOBS list, which can be accessed in a similar fashion, for other geoscience jobs.

SERVER ADDRESS: listserv@netcom.com
LIST ADDRESS: met-jobs@netcom.com

You may subscribe/resubscribe at any time by sending email to listserv@netcom.com containing the command "subscribe met-jobs". Majordomo will check the 'From:' tag on your message and will add it to the list. If the 'From:' does not contain a valid e-mail address, try subscribing by adding your e-mail address to the command above (e.g., subscribe met-jobs you@whatever.site).

To post an Employment Opportunity Announcement, send it as a message to met-jobs@netcom.com. The preferred format is to (1) include the educational level required, field, and location as the subject of the message [e.g., PhD: Meteorology: USA-KS would indicate a PhD-level meteorology position located in Kansas] and (2) format your message to a width of 72 characters or less (longer lines get truncated at some sites, including archive sites).

Posts to this list are partly moderated. All posts from non-subscribers are sent to the list owner for approval. All posts of more than 250 lines also are sent to the list owner for approval. All other posts are immediately sent to list subscribers.

Met-stud (administered by Dennis Schulze)

This mailing list is open to all, but particularly intended as a communications facility among meteorology students worldwide. Subjects of discussion could include scholarships, summer schools, conferences, and comparisons of the meteorology programs at various universities. Meteorological problems and questions could also be discussed.

To subscribe, send mail to listproc@bibo.met.fu-berlin.de with "SUB met-stud First_Name Last_Name" in the body of the message. Administrative mail should be sent to that address too.

The list's address itself is met-stud@bibo.met.fu-berlin.de. Although the list is based in Germany, the language used is English.

nfc (National Forecasting Contest)

This mailing list is open to everyone but particularly intended as a communication facility for participants of the National Forecasting Contest which is carried out over the Internet. The organizers hope that it will lead to debates about the issued forecasts and to discuss different ways of creating forecasts. Topics may also range from numerical models to current weather events. Everything which has to do with weather and forecasting is welcome.

To subscribe, send email to listproc@bibo.met.fu-berlin.de containing the line "sub nfc first_name last_name" in the message body. The list's address itself is nfc@bibo.met.fu-berlin.de. If you have any problems or questions send mail to dennis@bibo.met.fu-berlin.de. Though the list is situated in Germany the language is English.

Weather-users (administered by scott@zorch.sf-bay.org)
This list is for discussions of weather servers; sharing of code to automatically query weather servers; and announcements of availability (or lack thereof) and changes to weather servers. Initially, Jeff Masters (sdm@downwind.sprl.umich.edu) has agreed to send Weather Underground status notices to this list.
To join or quit the list, email to weather-users-request@zorch.sf-bay.org; the list mail address is weather-users@zorch.sf-bay.org.

WXOBS-SNE-DIGEST (run by Toddg@shore.net, Todd Gross)
This is a Southern/Central New England amateur weather observer mailing list where observations are made by weather watchers on a continuing basis and shared with the rest of those subscribed to the list. We are also accepting observations from nearby portions of N.Y. State. To subscribe to the digest version send email to WXOBS-SNE-DIGEST-REQUEST@SHORE.NET with "SUBSCRIBE" in the body of the message.

WXOBS-MDA (run by wxcentrl@Shore.net, William Hipkins)

This maillist is for those interested in obtaining more information regarding weather in the states of: New Jersey, Pennsylvania, Delaware, Maryland, Virginia, DC and parts of New York. You will receive weather watches/warnings, state summaries and forecasts, special weather statements, and best of all, local observations by other list subscribers. If you keep daily weather records for your community, you can post them to the list. There is also a digest version available.
To subscribe, send email to majordomo@shore.net. In the body of the message, include "SUBSCRIBE WXOBS-MDA" to subscribe to regular version or "SUBSCRIBE WXOBS-MDA-DIGEST" to subscribe to digest version. To send information to the list, mail to WXOBS-MDA@shore.net.

Wxsat (administered by Richard B. Emerson)
Wxsat resends all NOAA/NESDIS bulletins on polar and geostationary weather satellites as well as occasional material on Meteosat. Bulletins with orbital predictions, spacecraft operation schedules, and related messages are copied from NOAA.SAT on SCIENCEnet and forwarded to all addresses on the list. The list is configured to accept and broadcast mail from subscribers to the list at large. Wxsat does not store or distribute imagery and is not primarily a "chat" list. Wxsat is oriented towards users with a daily operational need for TBUS and related bulletins.
An archive of roughly 60 days' messages are available for retrieval via email messages to wxsat-archive@ssg.com. Send the message "help" in the text to the archive server for details on how to retrieve the current index and other files. There is also an archive for programs and gifs at <URL:ftp://kestrel.umd.edu/pub/wxsat/>.
Subscription requests go to wxsat-request@ssg.com.

WX-TALK and other WX-lists
WX-TALK, formerly STORM-L, is a mailing list for weather-related topics, special event notifications, job announcements, and administrative

messages. This list, and other specialized weather-related lists, are
run from the vmd.cso.uiuc.edu (UIUCVMD) machine at Urbana-Champaign,
Illinois. WX-TALK is for discussions and questions; the others are intended
to distribute information on particular topics, but you should not
post mail to them.
To join the list, send a message consisting of the single line
"SUB WX-TALK Your Name" to whichever of these addresses works for you:
LISTSERV@UIUCVMD / LISTSERV@UIUCVMD.BITNET / LISTSERV@VMD.CSO.UIUC.EDU
or uiucuxc!vmd!listserv from uucp.
Contributions should then go to WX-TALK@[working address]
For more information, and a list of the other WX-lists on vmd.cso.uiuc.edu,
use anonymous FTP to retrieve the file WX-TALK.DOC from vmd.cso.uiuc.edu
in the directory "wx".

Volcano mailing list (edited by Jon Fink)
Send submissions and subscription requests to Jon Fink at
aijhf@asuvm.inre.asu.edu, or aijhf@ASUACAD (via Bitnet).

~Subject: 5) Institutional home pages -- non-US

<URL:http://www.wmo.ch>
World Meteorological Organization (WMO)

<URL:http://www.dow.on.doe.ca>
Environment Canada home page (Toronto, ON). Contains links to other
Environment Canada servers:
Environment Canada - Green Lane (Ottawa) <URL:http://www.doe.ca>
Environment Canada - Bedford, Nova Scotia <URL:http://www.ns.doe.ca>
Environment Canada - Vancouver, British Columbia <URL:http://www.pwc.bc.doe.ca>
Great Lakes Information Management Resource <URL:http://www.cciw.ca/glimr/intro.html>
Canada Centre for Inland Waters <URL:http://www.cciw.ca/Welcome.html>

<URL:http://www.awi-bremerhaven.de>
Alfred Wegener Institute

<URL:http://rcru1.te.rl.ac.uk>
Chilbolton Radar Facilty, Radio Communications Research Unit at
Rutherford Appleton Laboratory

<URL:http://www.aodc.gov.au/AODC.html>
The Australian Oceanographic Data Centre

<URL:http://www.ml.csiro.au>
The CSIRO (Australia) Division of Oceanography

<URL:http://www.nerc-bas.ac.uk/>
British Antarctic Survey

<URL:gopher://babel.ho.bom.gov.au>
Australia Bureau of Meteorology

~Subject: 6) Institutional home pages -- US

US Government sites:

<URL:http://hypatia.gsfc.nasa.gov/NASA_homepage.html>
NASA system-wide home page

<URL:http://www.noaa.gov>
National Oceanic and Atmospheric Administration (NOAA)

<URL:http://www.nws.noaa.gov>
National Weather Service

<URL:http://www.erl.noaa.gov>
NOAA Earth Resources Laboratories

<URL:http://www.etl.noaa.gov>
NOAA Environmental Technology Laboratory

<URL:http://ns.noaa.gov/NESDIS/NESDIS_Home.html>
NESDIS (National Environmental Satellite, Data, and Information Service)

<URL:http://www.nohrsc.nws.gov>
National Operational Hydrologic Remote Sensing Center

<URL:http://www.epa.gov>
Environmental Protection Agency (EPA)

Regional Climate Centers:

<URL:http://climate.sage.dri.edu>
Western RCC

<URL:http://met-www.cit.cornell.edu/nrcc_home.html>
Northeast RCC

<URL:http://sercc.dnr.state.sc.us/sercc.html>
Southeast RCC

<URL:http://maestro.srcc.lsu.edu/srcc.html>
Southern RCC

<URL:http://hpccsun.unl.edu/>
High Plains RCC

Other institutions:

<URL:http://www.fnoc.navy.mil>
Fleet Numerical Oceanography Center

<URL:http://grads.iges.org>
Center for Ocean-Land-Atmosphere Studies (COLA)

<URL:http://wwwcaps.uoknor.edu>
Center for Analysis and Prediction of Storms (CAPS)

<URL:http://www.nssl.uoknor.edu>
National Severe Storms Laboratory

<URL:http://agwx.agry.purdue.edu>
Midwest Agricultural Weather Service Center

<URL:http://www.whoi.edu/>
Woods Hole Oceanographic Institution

<URL:http://www.water.ca.gov>
California Department of Water Resources home page

<URL:http://cires.colorado.edu>
Cooperative Institute for Research in Environmental Sciences (CIRES)

<URL:http://www.cira.colostate.edu>
Cooperative Institute for Research in the Atmosphere (CIRA)

<URL:http://www-pcmdi.llnl.gov>
Program for Climate Model Diagnosis & Intercomparison (PCMDI) of the Lawrence Livermore National Laboratory (LLNL)

<URL:http://www.infi.net/weather>
The Weather Channel home page

<URL:http://accuwx.com>
Accuweather

<URL:http://groundhog.sprl.umich.edu/IWW/>
International Weather Watchers

<URL:gopher://atm.geo.nsf.gov/11/AMS>
American Meteorological Society

<URL:http://www.agu.org/>
American Geophysical Union

<URL:http://vortex.weather.brockport.edu>
Department of Earth Sciences at the State University of New York at Brockport

<URL:http://meteor.atms.purdue.edu>
Purdue University Dept. of Earth and Atmospheric Science

~Subject: 7) Employment resources

These are Internet resources that may be useful in finding a job in atmospheric science or related fields.

<URL:http://www.calweb.com/~web-ads/>
A number of past MET-JOBS announcements are available at this site. See the description of MET-JOBS in the "mailing list" section of this document.

<URL:http://vortmax.rutgers.edu/met-dep/index.html>
This WWW site contains job listings culled from Usenet newsgroups and mailing lists, as well as pointers to other sites which contain both general and meteorology-related jobs.

~Subject: 8) Educational resources for teachers

Also see section 9, information on meteorology topics.

<URL:ftp://ftp.met.ed.ac.uk/calmet/>
Software and documents in support of computer-aided learning in meteorology; it is associated with the CALMET mailing list (described in the Resources FAQ).

<URL:http://cirrus.sprl.umich.edu>
University of Michigan Weather Underground contains many curriculum resources for K-12 education including the "Blue Skies" program. Also a list of other resources at <URL:http://cirrus.sprl.umich.edu/outreach/>.

<URL:http://www.ucar.edu:8080/ucargen/education/eduhome.html>
University Corporation for Atmospheric Research (UCAR)'s pointers to educational resources for K-12, undergraduate/postgraduate, and general public science literacy.

<URL:http://aws.com>
Automated Weather Source Inc.'s Nationwide School Weather Network. Some resources ("Virtual Schoolhouse") are under development.

<URL:http://faldo.atmos.uiuc.edu/WEATHER/weather.html>
Thematic unit for weather for grades two through four. Lessons in various subjects with a weather theme.

<URL:http://www.ncsa.uiuc.edu/edu/RSE/RSEred/WeatherHome.html>

"Weather Here and There" unit which incorporates interaction with the Internet and hands-on collaborative, problem solving activites for students in grades four through six.

~Subject: 9) Information on meteorology topics

General:

<URL:http://www.atmos.uiuc.edu/covis/modules/html/module.html>
UIUC Department of Atmospheric Sciences Electronic Textbook. Includes sections on air pressure, winds, and atmospheric optics; a guide to weather maps and images; a catalog of cloud types; and a storm-spotters' guide.

<URL:http://www.agu.org/everyone.html>
The American Geophysical Union's "Science for Everyone": selected papers from AGU about earth science topics.

Ozone:

<URL:http://www.cis.ohio-state.edu/text/faq/usenet/ozone-depletion/top.html>
<URL:http://www.lib.ox.ac.uk/internet/news/faq/archive/sea-level-faq.html>
<URL:ftp://rtfm.mit.edu/pub/usenet/news.answers/ozone-depletion>
Robert Parson's Ozone Depletion FAQ

<URL:http://acd.ucar.edu/gpdf/ozone/science/>
Stratospheric Ozone Law, Information & Science page. Links to policy information and scientific information on the ozone layer and the ozone hole.

<URL:http://www.epa.gov/docs/ozone/index.html>
EPA Ozone depletion web site. Includes information on the science, regulations to protect the ozone layer, fact sheets, Title VI of the Clean Air Act, info on the UV Index, a glossary of terms, and how consumers can help protect the ozone layer.

Climate change:

<URL:http://www.cis.ohio-state.edu/text/faq/usenet/sea-level-faq/top.html>
<URL:http://www.lib.ox.ac.uk/internet/news/faq/archive/sea-level-faq.html>
<URL:ftp://rtfm.mit.edu/pub/usenet/news.answers/sea-level-faq>
Bob Grumbine's Sea Level, Ice, and Greenhouses FAQ

Part 6/7

Summary: Books for scientists and laymen, journals, societies etc.

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/print-resources
Last-modified: 21 Sep 1995

Recent changes:

==within last two weeks==
Added Société météorologique de France to list of professional societies
Added La météorologie to list of magazines
Added Comprendre la météorologie to list of books for French-reading nonprofessionals

==within last four weeks==
Major reorganization
Added Royal Meteorological Institute of Belgium to list of professional societies
Added Association professionelle des meteorologistes du Quebec to list of professional societies
Added Significant Tornadoes to book listings
Added The Severe Local Storm Forecasting Primer (second edition of Severe Local Storms Forecasting Environments) to book listings

If the date in the headers of the document you're reading is more than a month old, you should retrieve a current copy. Current copies of this FAQ series can be obtained by anonymous FTP at <URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:
Meteorology FAQ Part 1/7: Intro
Meteorology FAQ Part 2/7: Sources of weather data
Meteorology FAQ Part 3/7: Sources of research data
Meteorology FAQ Part 4/7: Sources of CD-ROMs
Meteorology FAQ Part 5/7: Internet resources
Meteorology FAQ Part 6/7: Print and other resources <===
Meteorology FAQ Part 7/7: List of US State Climatologists

Corrections, additions, and comments should be sent to Ilana Stern at ilana@ncar.ucar.edu. Please include in your message where you read this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

Each (major) section has a "Subject:" line, so you can search on the subject title above to find the section quickly.

~Subject: 2) Overview

This is a guide to resources for laypersons, students and professionals in meteorology, oceanography, and related disciplines. This section of the FAQ focuses on non-Internet resources -- books and journals rather than WWW sites and newsgroups -- but there are occasional Internet references.

~Subject: 3) Books readable by English-reading nonprofessionals

"Clouds in a Glass of Beer -- Simple Experiments in Atmospheric Physics" by Craig Bohren.
"What Light through Yonder Window Breaks", Craig Bohren.

"How to Build a Habitable Planet", Wallace Broecker

Microbursts: A Handbook for Visual Identification, Fernando Caracena et al. (Second ed., Washinton: NOAA, 1990)

Handbook of Unusual Natural Phenomena, William Corliss (The Sourcebook Project, Glen Arm, MD, 1977) -- Collection of unusual weather observations from popular and scientific press. To be taken with a grain of salt.

"Storms" by William R. Cotton.

"Rainbows, Halos, and Glories", Robert Greenler (Cambridge University Press, 1980) -- atmospheric optics

"Light and colour in the outdoors", M.G.J. Minnaert, Springer 1993, ISBN 3540979352, 0387979352

"Lightning and its Spectrum: An Atlas of Photographs", Leon Salanave (Tucson: University of Arizona Press, 1980)

"Peterson's Field Guide to the Atmosphere", (mostly) by Vincent Shaeffer: A readable guide to many aspects of modern meteorology, with excellent qualitative coverage of many topics (optical effects, particles, clouds, precipitation) Dozens of good color pics, too. (Rick Russel, reviewer)

"Volcano Weather: The Story of 1816, the Year without a Summer", Henry Stommel and Elizabeth Stommel (Newport, RI: Seven Seas Press, 1983)

"A View of the Sea", Henry Stommel, Princeton University Press, 1987.

"All About Lightning", Martin A. Uman (New York: Dover, 1986)

"Lightning, Auroras, Nocturnal Lights, and Related Luminous Phenomena", Corliss, W.R., 1982. (Published and distributed by The Sourcebook Project, P.O. Box 107, Glen Arm, MD 21057) Tel: (301) 668-6047

The Nature of Ball Lightning, S. Singer (New York: Plenum Press, 1971)

"Atmospheric Phenomena: Readings from Scientific American" (San Francisco: WH Freeman, 1980)

"NOAA/NWS Advanced Spotter's Field Guide" (NOAA PA 92055) -- A new and pretty slick 28 p. pamphlet; many photos of tornadoes and sever thunderstorms. (Frank Reddy, reviewer)

"The Audubon Society Field Guide to North American Weather"

"WEATHER MAPS - How to Read and Interpret all the Basic Weather Charts" Chaston Scientific, Inc., P.O. Box 758, Kearney, MO 64060 or email chaston111@aol.com ($29, as of Jan 1995).

What I like about it from a teaching perspective is that all the meteorological principles are included in the explanation of the weather maps. I particularly like the chapter on weather forecast models, because it expalins the process in easy-to-understand, nonmathematical terms. (Thomas Magnuson, reviewer)

"Will it Rain? The Effect of the Southern Oscillation and El Nino on Australia", (2nd edition), Edited by I J Partridge. AUS$20, can be ordered from DPI Publications, GPO Box 46, Brisbane 4001, Australia, (07) 239 3100 phone, (07) 239 0860 fax.

This is a book for farmers, graziers, students and anyone else interested in the weather and seasonal forecasting. It explains the Southern Oscillation and El Nino. This is a revised and much enlarged version of the original (1991) Will it rain?, and is a companion volume to the software package AUSTRALIAN RAINMAN.

Significant Tornadoes, 1680-1991 (with supplement for 1992-1995), Tom Grazulis, 802/748-2505. 1350 pages.

The Severe Local Storm Forecasting Primer (second edition of Severe Local Storms Forecasting Environments) John S. Sturtevant.
A primer on forecasting techniques for Severe Local Storms. It includes Chart Analysis, Synoptic Situations, Indices Forecasting, Covers Radar, Satellite, Hail, Wind, Tornadoes, Flash Floods, Lightning, Geography, The Future, An Appendix of Computer Weather Services and Weather Software and a Thunderstorm Parameter Worksheet. Available from Weather Scratch Meteorological Services, 140 South Kirkman Street, Florence, Alabama 35630-4312, for $30 (checks made payable to John S. Sturtevant; this is the price of the earlier edition, I don't know about the new one) or email the author at 74034.1672@compuserve.com or phone (205) 766-8464/764-4333, fax (205) 766-846.

~Subject: 4) Books readable by French-reading nonprofessionals

Gros Temps sur la Planéte, J.-C. Duplessy and P. Morel, Odile Jacob, Paris, 1990

Glaces de l'Antarctique: une Mémoire, des Passions, C. Lorius, Odile Jacob, Paris, 1990

Comprendre la météorologie: La prévision numérique du temps et du climat. Michel Rochas, Jean-Pierre Javelle, Syros, Paris, 1994, 262 pp.

~Subject: 5) Magazines readable by nonprofessionals

La Météorologie
La Recherche (sometimes)
Scientific American (occasionally)
Weather
 email brugge@met.reading.ac.uk (Roger Brugge)
WeatherWatch
 email WXCENTRAL@AOL.COM
 <URL:http://northshore.shore.net/~wxcentrl/>
Weatherwise

~Subject: 6) Scientific Texts

Meteorology Today, C. Donald Ahrens, West Publishing, St. Paul, 1991 (4th edition; there is now a 5th edition, presumably with a new copyright date of 1994.) "This is the book I used in my lower division weather class (in a geography department) and I found it to be excellent" (J. Trust)

Ball Lightning and Bead Lightning: Extreme Forms of Atmospheric Electricity, James Dale Barry (New York: Plenum, 1980)

Tracers in the Sea, W. S. Broecker and T.-H Peng, Eldigio Press, Palisades, NY, 1982.

T. J. Crowley and G. B. North, Paleoclimatology, Oxford University Press, New York, 1991.

The Ceaseless Wind - An Introduction to the Theory of Atmospheric Motion John A. Dutton, Dover, 1976, 1986.

M. Ghil and S. Childress, Topics in Geophysical Fluid Dynamics: Atmospheric Dynamics, Dynamo Theory and Climate Dynamics, New York,Springer-Verlag, 1987.

Atmosphere-Ocean Dynamics by Adrian E. Gill, 1982.

Atmospheric Change: an Earth System Perspective, T.E. Graedel and P. J. Crutzen, Freeman, 1993.
"An introductory undergraduate textbook requiring very little background (freshman physics and chemistry; in fact most of the book is accessible to someone who has had good high school courses.) Lower-level than your other suggestions but very useful. Should be required reading for all netters :)." (Robert Parson, reviewer)

Theory of rotating fluids, by H. Greenspan

Climate Change 1992, James Houghton (Cambridge University Press, 1993)

A climate modelling primer, A. Henderson-Sellers and K. McGuffie. Chichester ; New York : Wiley, c1987.

Climate System Modeling, edited by Kevin Trenberth, Cambridge University Press, 1992. ISBN 0-521043231-6. "[This] is an extremely valuable contribution that goes well beyond previous texts in terms of comprehensive treatment of the climate system....including an introduction to the physical and human dimensions of the climate system, the components of the climate system (atmosphere, ocean, land surface), modeling and parameterization, system coupling and interactions, sensitivity experiments, and future prospects....For those who want more than passing knowledge before applying model results, Climate System Modeling should be a reference of choice."

(from review by Eric J. Barron)

Climate and Development, Karpen, Otten and Trinidade eds., Springer 1990.

An Introduction to Dynamic Meteorology, James R. Holton (Academic Press, New York, 2nd edition 1979, 3rd edition 1992

The Thunderstorm in Human Affairs, ed. by Edwin Kessler (3 vols.). Norman, OK: University of Oklahoma Press, 1983

Lindzen, R. S. "Dynamics in Atmospheric Physics" (Cambridge University Press, 1990) "Application of simplified dynamics to the purpose of understanding some of the basic functioning of the atmosphere. Includes discussion of Hadley circulation, gravity waves, tides, climate. A collection of lecture notes, not a reference. Doesn't include an appendix (on purpose!)." (Perry G Ramsey -- reviewer)

Boundary Layer Climates, Tim R. Oke (Methuen, 1978, 1987)

Pedlosky, J. P. "Geophysical Fluid Dynamics" (Springer-Verlag, 1979, 1987)

J. P. Peixoto and A. H. Oort, Physics of Climate,
American Institute of Physics, New York, 1992"
(exists also in soft cover)

Descriptive Physical Oceanography 4th ed, G. L. Pickard and W. J. Emery, Pergamon Press, 1982.

Introductory Dynamical Oceanography 2nd ed., S. Pond and G. L. Pickard, Pergamon Press, 1983.

Atmospheric Science an introductory survey J. M. Wallace and P. V. Hobbs, Academic Press, 1977.

An introduction to three-dimensional climate modeling, Warren M. Washington, Claire L. Parkinson. -- Mill Valley, CA : University Science Books ; Oxford, New York : Oxford University Press, 1986.

El Nino, La Nina, and the Southern Oscillation, S.G. Philander, Academic Press, 1990, ISBN 0-12-553235-0

Chemistry of Atmospheres, Richard P. Wayne, 2nd Edition, Oxford 1991: senior or 1st-year graduate level. "The necessary atmospheric dynamics and chemical kinetics are covered in chapters 2 and 3, but some background in these subjects at sophomore or junior level is useful."
(Robert Parson, reviewer)

The Lightning Discharge, Martin A. Uman (New York: Academic Press, 1987)

Lightning, Martin A. Uman (New York: Dover, 1969)

Weather and Climate Responses to Solar Variations (Boulder, CO: Colorado Associated University Press, 1983)

Solar Variability, Weather, and Climate (Washington, D.C.: National Academy Press, 1982)

Trends '91: A Compendium of Data on Global Change (Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory -- see the Data FAQ for address). The book and data -- available on disk or via ftp -- are free. Trends '93 due out later this year. (Frank Reddy, reviewer)

~Subject: 7) Meteorological History

The History of Meteorology: To 1800, H. Howard Frisinger (Boston: American Meteorological Society, 1983)

A History of the Theories of Rain, W. E. Knowles Middleton (New York: Franklin Watts, 1965)

A History of the Thermometer, W. E. Knowles Middleton (Baltimore: Johns Hopkins Press, 1966)

~Subject: 8) Journals

Agricultural and Forest Meteorology
edited by: Dr. W. E. Reifsnyder, P.O.Box 739, Questa NM 87556 USA
Annales Geophysicae
Annals of Glaciology
Atmospheric Environment
Atmosphere-Ocean
Boundary-layer Meteorology
published by D. Reidel Pub. Co., Dordrecht, Holland
Bulletin of the American Meteorological Society
Climate Change
Climate Dynamics
Deep Sea Research
Dynamics of Atmospheres and Oceans
Earth and Planetary Science Letters
EOS
Geophysical Journal of the Royal Astronomical Society
Geophysical Research Letters
Global Biogeochemical Cycles
Int. J. Biometeorology
published by: Springer Verlag New York, Service Center Secaucus, 44 Hartz Way, Secaucus NJ 07094 USA
Int. J. Climatology

J. Applied Meteorology
J. Atmospheric Science
J. Climate
J. of Fluid Mechanics
J. of Geophysical and Astrophysical Fluid Dynamics
J. Geophysical Research
J. Glaciology
J. Marine Research
J. Oceanic and Atmospheric Technology
J. Physical Oceanography
J. of the Meteorological Society of Japan
Marine Geology
Meteorological Applications
published by the Royal Meteorological Society
Meteorologische Zeitschrift (English and German)
published by: Gebrueder Borntraeger, Johannesstrasse 3a, D-70176 Stuttgart, Germany
Meteorology and Atmospheric Physics
Monthly Weather Review
National Weather Association Digest
Nature
Nonlinear Processes in Geophysics (European Geophysical Society)
Ocealologica Acta
Paleoceanography
Palaeogeography, Palaeoclimatology, Palaeoecology
Quarterly Journal of the Royal Meteorological Society
Quaternary International
Quaternary Research
Remote Sensing of the Environment (Elsevier)
Reviews of Geophysics
Reviews of Geophysics and Space Physics
Science
Solar Energy
Tellus
Theoretical and Applied Climatology
published by: Springer Verlag, Sachsenplatz 4-6, A-1210 Wien, Austria
Weather and Forecasting
Wetter und Leben (Weather and Life; in German)
edited by: OEsterreichische Gesellschft fuer Meteorologie, Hohe Warte 38, A-1190 Wien, Austria

There are a few journal-related resources on the WWW:

<URL:http://www-cmpo.mit.edu/met_links/index.html> is an index to Internet-accessible supplements to published papers. Such supplements include datasets, plots, source code, and so on.

<URL:http://www.gfdl.gov/~smg/pointers/announcement.html> is an introduction to the "eprint archive" (electronic preprints) coordinated by GFDL for the atmospheric science community.

~Subject: 9) Professional Societies

American Meteorological Society

American Geophysical Union

Association professionelle des meteorologistes du Quebec
<URL:http://www.phy.uqam.ca:2000/apmq/apmq.html>

Australian Meteorological and Oceanographic Society
PO Box 654E, Melbourne 3001, Australia
Fax: (03) 669 4695

Canadian Meteorological and Oceanographic Society (CMOS).
Phone: 819-990-0300
email: cap@physics.carleton.ca

Dansk Meteorologisk Selskab
c/o Copenhagen University, Geofysisk Afdeling
Haraldsgade 6, DK-2200 Copenhagen N
Phone: +45 35 32 0567

Deutsche Meteorologische Gesellschaft (German Meteorological Society)
DMG Sekretariat, Mont Royal, D-56841 Traben-Trarbach Germany
Phone: (+49 6571) 59 12
<URL:http://www.met.fu-berlin.de/deutsch/DMG/index.html>

European Geophysical Society

International Glaciological Society

Irish Meteorological Society
c/o Irish Meteorological Service, Glasnevin Hill, Dublin 9, Ireland

Japanese Society of Snow and Ice
Phone:+81-3-3261-2339
Fax: +81-3-3262-1923

Meteorological Society of Japan
Phone: +81-3-3212-8341 ext.2546
Fax: +81-3-3216-4401

National Weather Association -- operational meteorologists and oceanographers
Phone: 205-213-0388
email: natweaasoc@aol.com

The Oceanography Society

OEsterreichische Gesellschaft fuer Meteorology

Hohe Warte 38, A-1190 Wien, Austria

Royal Meteorological Institute of Belgium
Ringlaan 3, B-1180 Brussels, Belgium
tel.: ++32-2-3730501
<URL:http://estirm2.oma.be>

Royal Meteorological Society
104 Oxford Road, Reading, Berkshire, RG1 7LJ, UK
Phone: 01734 568500 (from within UK)
Fax: 01734 568571 (from within UK)
<URL:http://typhoon.rdg.ac.uk/rms/rms.html>

Société météorologique de France
2, avenue Rapp 75 340 Paris Cedex 07

Part 7/7
Summary: List of US State Climatologists and Regional Climate Centers

Originator: ilana@kiowa.scd.ucar.edu

Archive-name: meteorology/state-climatologists
Last-modified: 12 Sep 1995

Recent changes:

==within last two weeks==

==within last four weeks==
New header material for FAQ series
Changed email address for SC SC David Smith
Added URLs for Regional Climate Centers
Changed URLs to conform to RFC 1808

If the date in the headers of the document you're reading
is more than a month old, you should retrieve a current copy.
Current copies of this FAQ series can be obtained by anonymous FTP at
<URL:ftp://ncardata.ucar.edu/other_resources/meteorology-faq/> or
in hypertext form via WWW at <URL:http://www.ucar.edu/dss/faq/>.

There are 7 documents in this FAQ series:
Meteorology FAQ Part 1/7: Intro
Meteorology FAQ Part 2/7: Sources of weather data
Meteorology FAQ Part 3/7: Sources of research data
Meteorology FAQ Part 4/7: Sources of CD-ROMs
Meteorology FAQ Part 5/7: Internet resources
Meteorology FAQ Part 6/7: Print and other resources
Meteorology FAQ Part 7/7: List of US State Climatologists <===

Corrections, additions, and comments should be sent to Ilana Stern at
ilana@ncar.ucar.edu. Please include in your message where you read
this FAQ series. Note that if I know about it, it's in these documents.

~Subject: 1) Table of contents

~Subject: 2) Overview

If you are looking for historical information for a US location, your best bet would be to contact the state climatologist for the area of interest. This unofficial list was compiled from a variety of sources, including the official list of State Climatologists, which is available from John Hughes at NCDC, JHUGHES@ncdc.noaa.gov.

Key to abbreviations:

T = Telephone
F = Fax
TM = Telemail
URL = www URL
O = Omnet
B = Bitnet
I = Internet

~Subject: 3) State Climatologists

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Satellite Imagery FAQ

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Subject: Satellite Imagery FAQ - Contents (1/5)

Archive-name: Satellite-Imagery-FAQ-1/5

The Satellite Imagery Proto-FAQ - contents
==========

Your attention is drawn to the Notice and Disclaimer below. If you
++
haven't already done so, please read them, particularly if you are
++
going to use or reproduce any of the information in this document!

(the Notice hasn't changed, it's just been moved to a friendlier place)!

This FAQ is the work of several authors, without whose valuable contributions, suggestions and encouragement it would not have been possible.

Introduction

==========

This FAQ deals with imagery of Earth from Space. It aims to combine some very brief introductory material with a guide to the numerous resources available on (and off) the Internet. It is the work of members of the IMAGRS-L (Image Processing & Remote Sensing) LISTSERV. We hope it will be of value to those whose work, studies or casual interest involve Remote Sensing of the Earth.

I have also included a couple of Remote Sensing answers. The philosophy here is simple: if it's somewhat relevant, and someone's posted (and I've seen) a good piece, then it may get included.

This is a hypertext (html) document. If you are reading it in any other format (eg plain text) you may find the presentation is not easy to follow. If this is a problem, feel free to say so (and if enough people complain, then maybe I'll do something)!

Call for Contributions: There are gaps in this FAQ. In addition, much of the material comprises my very brief and sketchy entries to cover what would otherwise be gaping holes! If you can fill any (or all :-) of them, please mail me. Material I can just cut-and-paste in is most likely to be useful/used.

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Contents

2. General Questions
   1. Can satellite imagery be used to watch newsworthy events?
   2. Employment
      - o Where can I advertise or look for a job in remote sensing?
   3. Software (& hardware!)
      - o Is there a list of Software Vendors?
      - o Where can I find information on Software Packages?
      - o What software is available in the Public Domain?
      - o Something about minimum hardware requirements (storage, processing power..)
      - o What kit do I need to recieve satellite imagery on my PC?
   4. What are the Earth Observation Standards body?
      - o Committe on Earth Observing Sensors (CEOS)
   5. Social & legal issues
      - o How does copyright affect satellite images?

3. Technical
   1. Image Basics
      - o What is a digital image?
      - o What is spatial resolution?
      - o What is temporal resolution?
      - o What is spectral resolution?
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   3. What are the different levels of imagery I can buy/download?
   4. Do I need geocoded imagery?
   5. Instruments
   6. Basic Processing (TBD)
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      - o What are the orbits of EO satellites?
      - o what is the advantage of a polar orbit? What can you see from a geostationary orbit (Meteosat)? Other orbits?
      - o Is there a list the various satellite's orbits?
      - o How do I convert Landsat Path/Row to Lat/Long?
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      - o How is satellite data recieved on the ground?
   9. Geo-referencing (someone?)
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      - o How can I assess my results?
      - o Is there a program to compute Kappa coefficients??
      - o How good can I expect my results to be in practice?

4. Further Information, tables
   - o Can you point me to a good online introduction to Remote Sensing?
   - o I have a question that isn't covered in the FAQ. Where should I look?
   - o Related Documents and FAQs
   - o Related Usenet Groups and Listservs
   - o WWW URL's
   - o Catalogue Services
   - o Acronyms
   - o Ground Stations/CEOS IDs
   - o Addresses for organisations.

5. Applications
   Outside the scope of this document, for the time being at least. However, the USGS keeps a map of Earth and Environmental Science resources on the net at http://info.er.usgs.gov/network/science/earth/index.html. See also the WWW Virtual Library (addresses under "WWW URL's" above)

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++++++++++++

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Substantial articles by other authors have also been included. These are credited in situ (I'll improve this list when the document is more complete).

As a rule, I'm trying to credit all FAQ entries. The possible exceptions are lists, which naturally tend to merge all known sources. List material has been contributed by all the authors named above.

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3. If all else fails, email nick@mail.esrin.esa.it for details.

END OF NOTICE

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Newsgroups: comp.infosystems.gis,sci.geo.meteorology
Subject: Satellite Imagery FAQ - 2/5

Archive-name: Satellite-Imagery-FAQ-2/5

Satellite Imagery

==========

What are the main Earth Observation Satellites and Instruments?
++

Weather Satellites
++++++++++++++++++

I know nothing about these: need to find some info.

The Meteosat GOES amd GMS weather satellites operate in geostationary orbits. That is to say, they orbit the Earth at the same speed as the Earth's rotation, thus constantly viewing the same area. This means that their temporal resolution is effectively unlimited, so they are able to generate the familiar weather 'movies'.

They are, however, of limited use for (other) remote sensing purposes. Geostationary orbits (more typical of communications satellites) are constrained to high altitude, and to the equator. Thus good viewing angles over high latitudes are not possible. The very large area images are at low

spatial resolution; the best achieved by Meteosat and GOES is 2.4Km (?).

Click here for a few pointers to weather pictures online, or see the Meteorology Resources FAQ for a far longer list.

Earth Observation Satellites
++++++++++++++++++++++++++++

See also the list below, containing pointers to detailed information and online imagery.

Earth Observation imagery takes a number of forms, of which the most traditional are optical and near-infrared radiation, from about 0.4 (blue) to 2.0 (IR) micrometers. Examples include Landsat, Spot and NOAA. These generally use tracking instrunents, the basic principles of which are briefly described in Part 2 of this FAQ (someone point me to a proper intro on the net - SURELY there must be one)!.

Colour
++++++

After basic processing, imagery from these satellites may appear as photographs. With certain visual imagery - eg SPOT - it is even possible to display images in more-or-less their natural colour. In practice, images for display are generally manipulated to appear visually pleasing and to show interesting detail, and appear in false colour. Visible and non-visible (IR) bands may be freely mixed in false colour images. There are no firm rules about this, but by convention clouds are shown as white, and vegetation (where appropriate) green.

Resolution
++++++++++

Resolution is determined primarily by instrument design, and generally involves various compromises:

1. High spatial resolution implies imaging a small area. For an image of 1000 pixels square, at 20m resolution the area viewed is 20x20Km, but at 1Km resolution this increases to 1000x1000Km (actually rather more, due to the variation in viewing angle over a large area). The latter is therefore intrinsically suited to large-scale studies.
2. High spatial resolution also implies a high sampling frequency, which may limit the sensitivity of the sensor.

Types of Imagery
++++++++++++++++

Apart from visual and near-infrared, other bands of the spectrum commonly used include thermal infrared (heat) and microwave (radar). Each of these has its own applications.

3-dimensional Imagery
++++++++++++++++++++

We see the world in three dimensions by virtue of having two eyes, viewing the world at slightly different angles. It is possible to emulate this and produce 3-dimensional (stereo) satellite imagery, by superimposing images of the same ground area, viewed from different angles (and at different times). A limited number of satellites have this capability.

Synthetic Aperture Radar
++++++++++++++++++++++++

What is SAR?
++++++++++++

Synthetic Aperture Radar. An active microwave instrument, producing high-resolution imagery of the Earth's surface in all weather.

There is a good introduction to imaging radar by Tony Freeman of JPL at http://southport.jpl.nasa.gov/desc/imagingradarv3.html

Should we have an embedded intro for the benefit of non-WWW readers? I can ask to include the above, or try and solicit an equally expert intro from someone here

What are the main SAR platforms?
++++++++++++++++++++++++++++++++

Several past, present and future Earth Observation Satellites. Also the Shuttle Imaging Radar missions. See the table for a full list.

o ERS-1/ERS-2
o JERS-1
o Shuttle Imaging Radar SIR-C/X-SAR
o Almaz

the future...

o RadarSat
o ENVISAT (I'm not even making a link until I've something REAL to put there)!
o OK, what have I forgotten about (or never heard of)?

What distinguishes SAR from hi-res optical imagery?
++

Two main properties distinguish SAR from optical imagery:

o The SAR is an active instrument. That is to say, it generates its own illumination of the scene to be viewed, in the manner of a camera with flash. The satellite's illumination is coherent: i.e. all the light in any flash is exactly in phase, in the manner of a laser, so it does not simply disperse over the distance between the satellite and the Earth's surface. A SAR instrument can measure both intensity and phase of the reflected light, resulting not only in a high sensitivity to texture, but also in some three-dimensional capabilities. Experiments with the technique of Interferometry (measuring phase differences in exactly aligned images of the same ground area) have shown that SAR can accurately model relief, and appears able also to detect small changes over time. A paper describing the technique and experiments is available at http://gds.esrin.esa.it/A0x0000001c.

  Some consequences of being an active instrument (and using coherent light) are:
  o Works equally day or night
  o Polarised - can be used to gain additional information (esp. when different polarisations are available on the same platform - as on the most recent Shuttle missions).
  o Needs a lot more power than passive sensors, and can therefore only operate intermittently.
  o Suffers from speckle, an artifact of interference patterns in coherent light, sensitive to texture.

o SAR is Radar - i.e. it uses microwave frequency radiation. (note that in consequence, references to "light" above should more strictly read "microwave radiation"). Microwave radiation penetrates cloud and haze, so SAR views the Earth's surface (land and sea) in all weather. For general purpose Remote Sensing, this is probably the major advantage of SAR.

  An example of its use is the ESA/Eurimage "Earthwatch" programme, producing imagery of natural and other disasters when weather conditions prevent other forms of surveillence. Earthwatch imagery is available at http://gds.esrin.esa.it/CSacquisitions

What are SAR images good for ?
++++++++++++++++++++++++++++++

this wants a better entry - else I'll just point to a bibliography on the Net

o Sensitive to texture: good for vegetation studies.
o Ocean waves, winds, currents.
o Seismic Activity
o Moisture content

What is the meaning of colour in a SAR image?
++

Of course, all SAR image colour is false colour: the notion of true colour is meaningless in the context of invisible microvawe radiation.

Most SAR images are monochrome. However, multiple images of the same scene taken at different times may be superimposed, to generate false-colour multitemporal images. Colour in these images signifies changes in the scene, which may arise due to a whole host of factors, such as moisture content or crop growth on land, or wind and wave conditions at sea. SAR is particularly well-suited to this technique, due to the absence of cloud cover.

The shuttle SAR's images are the nearest to 'natural' colour, in the sense that they are viewing three different wavelengths, which can be mapped to RGB for pseudo-naturalistic display purposes (essentially the same as false colour in optical/IR imagery).

Need a proper multitemporal image entry

Radar Altimetry
+++++++++++++++

Technique used extensively to map the oceans. There are introductions at http://www.satobsys.co.uk/home_page.html and http://dutlru8.lr.tudelft.nl/pages/atlas.html. The latter includes the Altimetry Atlas, computed from GEOSAT, ERS-1 and TOPEX-Poseidon altimetry data.

What are the main Earth Observation Satellites and Sensors
++

Here is a list of some EO missions. These entries should become html links to further information (esp. details of imagery and where to get it if applicable) on an ad-hoc basis, as and when I have the information to put there (contributions sought) and the time to edit them in.

For detail on any of the following (and others), try a keyword search on Esrin's GDS at http://gds.esrin.esa.it/.

See also http://gds.esrin.esa.it/CIDN_PROVA.source

- o ADEOS Advanced Earth Observing Satellite (launch 1996, Japan)
  - o OCTS Ocean Color and Temperature Scanner
  - o AVNIR Advanced Visible and Near-Infrared Radiometer
  - o NSCAT NASA Scatterometer
  - o TOMS Total Ozone Mapping Spectrometer
  - o POLDER Polarization and Directionality of the Earth's Reflectance
  - o IMG Interferometric Monitor for Greenhouse Gasses
  - o ILAS Improved Limb Atmospheric Spectrometer
  - o RIS Retroflector in Space
- o Almaz
  - o SAR
- o DMSP Defense Meterological Satellite Program
  - o SSM/I (Special Sensor Microwave/Imager)
  - o Visible
- o ERS-1 Earth Resources Satellite
  - o AMI (Active Microwave Instrument), Wind mode, Wave mode, SAR (Synthetic Aperture Radar)
  - o Radar Altimeter
  - o ATSR-M (Along-Track Scanning Radiometer and Microwave Sounder)
  - o PRARE (Precise Range & Range Rate Equipment)
- o ERS-2 as ERS1 with addition of
  - o GOME Global Ozone Monitoring Experiment
- o GEOS Geodynamics Experimental Ocean Satellite
- o GEOSAT GEOdetic SATellite
- o GMS Geostationary Meteorological Satellites (140 E)
  - o VISSR (Visible and Infra-red Spin Scan Radiometer)
- o GOES Geostationary Operational Environmental Satellite (75 W and 135 W)
  - o VISSR (Visible and Infra-red Spin Scan Radiometer) altimeter
- o HCMM Heat Capacity Mapping Mission
  - o HCMR (Heat Capacity Mapping Radiometer), visible + thermal
- o INSAT Geostationary satellite of India (74 E)
- o IRS Indian Remote Sensing Satellite System
  - o LISS I & II (Linear Imaging Self Scanning Sensors)
- o JERS-1 Japanese Earth Resources Satellite
  - o OPS Optical Sensors
  - o SAR (Synthetic Aperture Radar)
- o KOSMOS Russian EO satellite
- o Landsat
  - o TM (Thematic Mapper)
  - o MSS (Multi-Spectral Scanner System)
  - o RBV (Return Beam Vidicon) camera
- o METEOR Russian meteo satellites (2-21, 3-3, 3-5)
- o Meteosat (0 E, Greenwich meridian)
  - o Visible/near infra-red

- o middle IR
- o Watervapour, thermal infra-red
- o MOS Marine Observation Satellite
  - o MESSR Multispectral Electronic Self Scanning Radiometer
  - o VTIR Visible and Thermal Infrared Radiometer
  - o MSR Microwave Scanning Radiometer
- o Nimbus 7
  - o CZCS Coastal Zone Color Scanner
  - o ERB Earth Radiation Budget
  - o LIMS Limb Infra-red Monitor for the Stratosphere
  - o SAM-II Stratospheric Aerosol measurement (II)
  - o SAMS Stratospheric and Mesospheric Sounder
  - o SBUV Solar and Backscatter ultraviolet Spectrometer
  - o TOMS (Total Ozone Mapping Spectrometer)
  - o SMMR (Scanning Multichannel Microwave Radiometer)
  - o THIR Temperature Humidity Infra-red Radiometer
- o NOAA Polar Orbiting Environmental Satellites (series)
  - o AVHRR Advanced Very High Resolution Radiometer
  - o TOVS (TIROS Operational Vertical Sounder)
  - o SBUV/2 Solar Backscatter Ultraviolet Spectrometer
- o Radarsat (launch August 1995, Canada)
  - o SAR
- o SeaStar
  - o SeaWiFS Sea-viewing Wide Field-of-view Sensor
- o SeaSat Ocean Dynamics Satellite
  - o SAR L-band
  - o ALT Radar altimeter
  - o SASS Radar Scatterometer
  - o SMMR Scanning Multi-Spectral Microwave Radiometer
  - o VIRR Visible en Infra-red Radiometer
- o Shuttle
  - o SIR-A Shuttle Imaging Radar
  - o SIR-B
  - o SIR-C (cross polarized returns VH and HV) (Apr+Oct 1994)
  - o LFC Large Format Camera
  - o MOMS Modular Opto-electronic Multi-spectral Scanner (2 bands)
- o SkyLab
  - o S 192 MSS Multispectral Scanner
  - o Metric camera experiment
- o SPOT
  - o HRV High Resolution Visible (2x) has 2 modes:
    - o XS (MultiSpectral mode)
    - o PAN (PANchromatic mode)
- o SPOT 4 (launch 1995)
  - o HRVIR High Resolution Visible and Infrared
- o TIROS, TOS and ITOS forerunners of the current NOAA series (9-12+14, 13 failed just after launch). See NOAA above.
  - o AVHRR Advanced Very High Resolution Radiometer

- o TOVS (TIROS Operational Vertical Sounder) consisting of:
  - o HIRS/2 infra-red sounder
  - o SSU stratospheric sounding unit
  - o MSU microwave sounding unit
- o TOPEX/POSEIDON
  - o ALT Radar Altimeter
  - o TMR TOPEX Microwave Radiometer
  - o LRA Laser Retroreflector Array
  - o SSALT Single-Frequency Solid-State Radar Altimeter
  - o DORIS Dual-Doppler Tracking System Receiver
  - o GPSDR GPS Demonstration Receiver
- o TRMM Tropical Rainfall Measuring Mission (launch 1997, Japan)
  - o PR Precipitation Radar
  - o TMI TRMM Microwave Imager
  - o VIRS Visible Infrared Scanner
  - o CERES Clouds and the Earth's Radiant Energy System
  - o LIS Lightning Imaging Sensor

Military / Intelligence Imagery
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Didn't President Clinton recently declassify some military imagery?
++

By an order dated 23rd Feb 1995,

- o Imagery from the CORONA, ARGON, and LANYARD missions to be declassified within 18 months.
- o Review process to be instituted for other imagery.

Details and imagery are available at
http://edcwww.cr.usgs.gov/dclass/dclass.html.

Where can I get Imagery?
++++++++++++++++++++++++

This very frequently asked question has several parts, which are addressed in various parts of this FAQ:

- o Where can I get full products? (LIST - TBD)
- o Where can I see/get samples of [some satellite's imagery] ?
- o Where can I browse imagery for [some specific geographic location]?
  Most of the references in this FAQ are global in scope - enter lat/long or click a map.
- o Where can I get current weather pics (online) ?
- o Where can I browse images on the Web?

o Where can I get whole-world images?
o Where can I get full-resolution imagery cheap or free?
o Where can I get imagery for [my type of application]?
That's outside the scope of this document - for the time being at least - but check in the Further Reading

How do I access the imagery catalogues?
++++++++++++++++++++++++++++++++++++

There are a number of catalogue services available for interactive login, via telnet; a few of these also offer alternative access methods, including WWW. These will give full catalogue information, and browse products online (typically by ftp). Some addresses for these are listed under further reading.

CEOS IDN
+++++++

The CEOS International Directory Network comprises three coordinating nodes, together with a number of cooperating nodes. Each coordinating node includes access to every known imagery catalogue, so in principle you never need more than one address. These are listed in further information.

Cintex
++++++

The Catalogue Interoperability Experiment aims to ensure interoperability between the various catalogues.

GUIs for catalogue access
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Various dedicated GUI systems exist to assist CINTEX catalogue users. These include:

o DLR ISIS
o ESA UIT
o NASA EOSDIS V0 IMS

Details are available at http://gds.esrin.esa.it/Ccintex.cs.clients.

WWW Browse Services
++++++++++++++++++

In addition to the login services, there are some services available on the WWW, offering a world-map and forms-based interface. These include:

http://shark1.esrin.esa.it/
Ionia AVHRR browser

http://tracy.esrin.esa.it:8000/
Multi-Mission Browse Service: NOAA AVHRR, ERS-1 SAR, JERS OPS, Landsat TM. Prototype: availability intermittent.
http://www.coresw.com
"Imagenet" service - Landsat, SPOT and a promise of Sovinformsputnik. Appears only to have data for America when last checked. Commercial; the free service is limited.
Http://ic-www.arc.nasa.gov/ic/projects/bayes-group/Atlas/Earth/
Browser for Earth Observations from Shuttle (but either I or they have a problem that needs fixing: someone tell me if it will actually serve you images)?

Where can I get full-resolution imagery cheap or free?
++

Answer 1: In general, you can't!
Answer 2: Old Landsat. The following was posted by Wim Bakker on IMAGRS-L:

Paul DeVries (bosse@bahnhof.se) writes:

> Can anyone point me in the direction of satellite imagery of (dry) Andean
> altiplano, very cheap or in the public domain, of any vintage? Thanks.

In principle the old Landsat TM (acquired from July 16, 1982 through September 27, 1985) and old Landsat MSS (older than 2 year) are available at reduced prices:

MSS	$ 200
TM raw	$ 300
TM systematic corrected	$ 425
TM precision corrected	$ 600

Inquires can be made to

Customer Services
EROS Data Center (EDC)
Sioux Falls SD 57198
(605)-594-6151

In the mean time you can check on the Inventory service of EDC

URL telnet://glis.cr.usgs.gov

whether any images of your area of interest are available.

WholeWorld Images
++++++++++++++++++

This answer is slanted towards Global AVHRR Land datasets. Anyone care to talk about other images?

Why create whole-world images?
Because they're fun, of course! :-)
Continental to global scale images are useful if they show information that is studied at a large scale, such as the state of the global biosphere. One major measure is NDVI, which characterises 'greenness' (see RS/Vegetation FAQ for details). Global NDVI images taken regularly over time - at intervals between one and two weeks - enable scientists to study change in the biosphere in detail.

How do they create whole-world images
The AVHRR Pathfinder and Global 1KM projects have created global land datasets showing NDVI (together with lower-level data) from AVHRR imagery, at resolutions up to 1.1KM. The global images are created by mosaicing a large number of individual scenes, taken over ten-day periods. Individual scenes are first stitched to generate half-orbits (in principle south to north pole, but generally broken because only daytime data is used)! The half orbits are then stitched together, with reference to a digital chart of the world.

The key to compositing for NDVI is that each point on the Earth's surface is replicated in several images over the sampling period. Only the best NDVI value is selected, so bad data (such as cloud cover) is discarded.

Why AVHRR? Why not, say, Landsat?

Yes, Landsat data is just as well-suited to computing NDVI as is the AVHRR.

The NOAA satellites, in a polar orbit at an altitude of 833 KM, orbit the Earth fourteen times per day. The AVHRR instrument images a 2400-KM wide swath as it passes. Thus every point on the Earth's surface is viewed at least about once per day (the exact frequency of course varies with latitude).

The Landsat series (4-5), in near-polar orbits at 705 KM, also orbit the Earth fourteen times per day. However, the swath imaged is just 185KM, so a point on the equator may be viewed only once in sixteen days. The data with which to generate weekly, ten-day or fortnightly global composites is simply not available. A sixteen-day composite would of course be subject to considerable cloud-cover (see below).

How do they get rid of the cloud?

As noted above, only the best NDVI values from each input dataset is used. Clouds will necessarily generate very low NDVI values - clouds are not green!. Hence clouds are automatically filtered out in the compositing process, provided there is at least one cloudless view of a point within the sample. Thus cloudlessness is not in fact guaranteed, but is statistically a very high probability (alternatively, it can be assured by collecting data over an unlimited time period; c.f. the GeoSphere project).

Clearly this will work if and only if the characteristics being studied are dissimilar to any cloud in at least one of the available bands!

Further reading:

http://sun1.cr.usgs.gov/landdaac/comp10d.html
Access to global 10-day composites from USGS/EDC
http://shark1.esrin.esa.it/
Ionia browser - AVHRR scenes and a browse version of a global composite from ESA/ESRIN
http://xtreme.gsfc.nasa.gov/
AVHRR Land Pathfinder from NASA/GSFC - various global composites.
http://infolane.com/infolane/geosphere/geospher.html
The GeoSphere project (commercial)

All the above references deal with global land datasets. NASA's pathfinder program created also Ocean and Atmospheric datasets:

Archive-name: General Questions-FAQ-2/5

http://sst-www.jpl.nasa.gov/
SST Pathfinder from NASA/JPL
http://pegasus.nesdis.noaa.gov//pathfinder.html
Atmosphere pathfinder from NOAA

Can satellite imagery be used to watch newsworthy events?
++

Earthquakes, floods, volcanos, mega-icebergs, pollution disasters...
There is imagery for all of them! Watch relevant newsgroups as news of a disaster breaks.
That's not to say there is immediate and extensive coverage of every possible event: the satellites capable of imaging it may not be in the right place at the right time! However, systematic programmes exist; notably the ESA/Eurimage Earthwatch program at http://gds.esrin.esa.it/CSacquisitions Other programmes include monitoring for oil slicks in high-risk areas, and monitoring forest fires.

(FIND_REFS)

Where can I advertise or look for a job in Remote Sensing?
++

Note: there is a very high percentage of duplication between these sources!

- o The University of Minnesota's GIS Jobs Clearinghouse at http://wwwrsl.forestry.umn.edu:10000/rsgisinfo/jobs.html. This also provides pointers to several other sources.
- o The GIS-JOBS list at gopher://nisp.ncl.ac.uk:70/11/lists/gis-jobs
- o The GEOSCI-JOBS listserv (may be unstable). Send subscription requests to listserv@netcom.com. You will recieve details on how to post to the list, and guidelines for what is appropriate.

In addition to the above, comp.infosystems.gis tolerates a certain range of job postings. Please read the detailed guidelines in that group's FAQ before posting.

Software
++++++++

Here's a complete cop-out: software is rather well covered in related documents.

Is there a list of Software Vendors?
++++++++++++++++++++++++++++++++++++

Where can I find information on Software Packages?
++

These questions are covered in the comp.infosystems.gis FAQ.

What software is available in the Public Domain?
++

See the Public Domain Cartographic Software FAQ.

Pointers to the FAQs are here.

For image processing, there exist:

- o Khoros, from ftp://ftp.khoros.unm.edu/ / http://www.khoros.unm.edu/ or (supposedly) http://www.infc.ulst.ac.uk:80/informatics/research/vision/khoros/
- o Grass, from ftp://moon.cecer.army.mil/

A few more listed FYI with no comment (in all but one case, simply because I know nothing):

o http://dcz.gso.uri.edu/XBrowse/browse/browse.html XBrowse- A client-server browse application for satellite AVHRR imagery.
o Land Analysis System, from USGS/EDC (Landsat TM & NOAA AVHRR)
o http://www.atmos.washington.edu/gcg/SV.man/SVmanual.html Satview (University of Washington).

Standards Committee
++++++++++++++++++

Committee on Earth Observations Satellites (CEOS)
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I hope reproducing this paragraph isn't violating copyright - anyone? It comes from too many sources to attribute!

CEOS was created in 1984 as a result of the international Economic Summit of Industrialized Nations and serves as the focal point for international coordination of space-related, Earth observation activities. Policy and technical issues of common interest related to the whole spectrum of Earth observation satellite missions and data received from such are addressed. CEOS encourages complementarity and compatibility among space-borne Earth observing systems through coordination in mission planning, promotion of full and non-discriminatory data access, setting of data product standards, and development of compatible data products, services, and applications. The user community benefits directly from this international coordination.

The CEOS information system is at http://gds.esrin.esa.it/CCEOSinfo, and contains full details and CEOS files.

See also CEOS calibration pages at
http://southport.jpl.nasa.gov/calceos/calceos.html

CEOS also sponsors

The CEOS International Directory Network (CEOS IDN)
++

Need someone to wirte a real entry This is the authoritative worldwide information system that answers every possible question about Satellite Earth Observation. The complete database is held at the three coordinating nodes in America (NASA/GSFC), Europe (ESA/ESRIN) and Asia (NASDA/EOC). For access details, see under Further Information.

How does Copyright affect Satellite Imagery?
==========

Wim Bakker recently supplied the following article, in part a translation from a (Dutch) NLR article. I have taken the liberty of cutting it down somewhat.

) Copyright
****

There is a lot of confusion about the copyright connected to the use of satellite images and everything related to this.

According to Websters dictionary "copyright" is

1. copy.right \-.r{i-}t\ n : the exclusive legal right to reproduce, publish, and sell the matter and form of a literary, musical, or artistic work - copyright aj

2. copyright vt : to secure a copyright on

In 1886, during the Convention of Bern the matter of copyright was regulated internationally. It states that the author (creator) of a certain matter remains the owner of his product. This also means that if you buy a copyrighted product you pay for the use of this product and you can never claim to be the owner of such a product. Furthermore, you can never claim any other rights about such a product (e.g. the right to reproduce the product).

In copyright the following 5 stages can be distinguished:

1. the creation of a product
2. the manufacturing of a product
3. the distribution of a product
4. the use of a product
5. the reproduction of a product

These 5 points can also be distinguished with the use of satellite images. Two operational Earth observing satellites will be described here: Landsat and SPOT.

Here I have cut a detailed description of Landsat and SPOT distribution, as being (IMHO) too detailed for this FAQ - NK.

Now when does the copyright principle touch the user?
Only when the user reproduces or copies (point 5) the satellite images is he affected by the copyright issue. At all times the user must be aware of the owner/producer of the data. The owner/producer may or may not permit the reproduction of the datas, but must in any case be mentioned on all publications of satellite images!

Note: the following details may vary in different parts of the world, although the principles apply in any case.
For SPOT data this will be CNES; for Landsat data received by European ground stations this will be ESA; and for Landsat data from America this will be EOSAT (or NOAA and EROS Data Center (EDC) for old data).

The owner/producer indicates which reproductions are allowed. The reproduction of raw data - copying CCT's and film - is never allowed and for other categories that are allowed the owner will ask for a certain contribution for the right to reproduce the data; this is called the reproduction fee.

The following reproductions are free of reproduction fee

- o Posters, slides, advertisement or publications used for conferences, meetings, symposiums and exhibitions in the field of Remote Sensing.
- o Technical reports of RS conferences, symposiums etc.
- o Scientific reports and papers

For the following, a reproduction fee is due:

- o Newspapers
- o Magazines
- o Brochures
- o Books not related to the field of RS
- o Posters, either ones that are sold as well as free copies
- o Calendars
- o Atlasses
- o Postcards and invitations
- o Using images on TV and video

At all times the owner/producer must be mentioned on the reproductions, even if no reproduction fee is due!
This can be done in two ways

1. To use the word copyright followed by the owner/producer and the year of production. E.g.
   Copyright ESA 1988

2. To use the international sign for copyright) followed by the owner/producer and the year of production. E.g.
) CNES/NLR 1994
   In the last example the NLR could have processed data from SPOT.

Conclusion
==========

o For some (scientific) applications you owe no reproduction fee.
o At all times the owner/producer must be mentioned on
reproductions using the word copyright or the sign)
o In case of doubt, ask your distributor!

Fom: Nick.Kew@plod.esrin.esa.it (Nick.Kew)
Date: Fri, 28 Apr 1995 21:17:26 +0000
Newsgroups: comp.infosystems.gis,sci.geo.meteorology
Subject: Satellite Imagery FAQ - 3/5

Archive-name: Satellite-Imagery-FAQ-3/5
Image Basics (HTML)

Contributed by Wim Bakker (bakker@itc.nl)

What is an image?
==========

A digital image is a collection of digital samples.
The real world scene is measured at regular distances (=digital). One such measurement is limited in

o Space
One sample covers only a very small area from the real scene.
o Time
The sensor needs some integration time for one measurement
(which is usually very short).
o Spectral coverage
The sensor is only sensitive for a certain spectral range.

Furthermore, the sample is quantized, which means that the physical measure in the real world scene is represented by a limited number of levels only. Usually 256 levels of "grey" are sufficient for digital images; 256 levels can be represented by an eight bit unsigned Digital Number (DN). "Unsigned" because the amount of light is always positive. More levels will need more bits; the quantization determines the amount of bits per pixel on the image storage.

Image samples are usually called pixel or pel after the combination of "picture" and "element". A pixel is the smallest unit of a digital image. The size of this unit determines the resolution of an image. The term resolution is used for the detail that can be represented by a digital image. As discussed before the resolution is limited in four ways:

o Spatial resolution.
If one pixel is a ground cell sample of 20 by 20 meter then no

objects smaller than 20 meter can be distinguished from their background. This doesn't necessarily mean they cannot be detected!

Note that if the spatial resolution doubles, the amount of image data increases by a factor 4!

o Temporal resolution.

A distinction can be made between

o Temporal resolution of one image.

Fast moving objects will appear blurred on one image. E.g. the temporal resolution of one TV image is about 1/25 of a second.

o Temporal resolution of a time series of images.

If the images are taken sparsely in time then the possibility exists that some phenomena will be missed. The resolution of Landsat is 16 days, of SPOT 26 days and of NOAA 4 hours. So the latter satellite is said to have a high temporal resolution even though the spatial resolution is low compared to the two other satellites! (1.1 km and 20-30 m)

o Spectral resolution.

Current imaging satellites usually have a broad band spectral response. Some airborne spectrometers exist that have a high spectral resolution; AVIRIS Airborne Visible/Infrared Imaging Spectrometer (from NASA/JPL) has 224 ba nds, GERIS Geophysical and Environmental Research Imaging Spectrometer has 63 bands.

o Quantization.

E.g. if 100 Lux light gives DN 200 and 110 Lux yields DN 201 then two samples from the original scene having 101 and 108 Lux will both get the DN 200. Values from the range 100 up to 110 Lux can not be distinguished.

Image Formats (HTML)
Contributed by Wim Bakker
(bakker@itc.nl)

Image data on tape
==========

Looking at the images stored on tape there's three types of information

- o Volume Directory, which is actually meta-information about the way the headers/trailers and image data itself are stored
- o Information about the images
  This information can be stored in separate files or together with the image data in one file.
  This information can be virtually anything related to the image data
  - o Dimensions. Number of lines, pixels per line and bands etc.
  - o Calibration data
  - o Earth location data
  - o Orbital elements from the satellite
  - o Sun elevation and azimuth angle
  - o Annotation text
  - o Color Lookup tables
  - o Histograms
  - o Etc. etc...

  The information is often called a header, information after the image data is called a trailer
- o The pure image data itself

The image data can be arranged inside the files in many ways. Most common ones are

- o BIP, Band Interleaved by Pixel
- o BIL, Band Interleaved by Line
- o BSQ, Band SeQuential

If the pixels of the bands A, B, C and D are denoted a, b, c and d respectively then BIP is organized like

abcdabcdabcdabcdabcdabcdabcdabcdabcd... line 1
abcdabcdabcdabcdabcdabcdabcdabcdabcd... line 2
abcdabcdabcdabcdabcdabcdabcdabcdabcd... line 3
...
abcdabcdabcdabcdabcdabcdabcdabcdabcd...
abcdabcdabcdabcdabcdabcdabcdabcdabcd...

BIP can be read with the following pseudo-code program

```
FOR EACH line
   FOR EACH pixel
      FOR EACH band
         I[pixel, line, band] = get_pixel(input);
```

BIL looks like

```
aaaaaaaaaaaa... band 1, line 1
bbbbbbbbbbbb... band 2
cccccccccccc... band 3
dddddddddddd... band 4
aaaaaaaaaaaa... band 1, line 2
...
```

BIL can be read with the following pseudo-code program

```
FOR EACH line
   FOR EACH band
      FOR EACH pixel
         I[pixel, line, band] = get_pixel(input);
```

BSQ shows

```
aaaaaaaaaaaa... line 1, band 1
aaaaaaaaaaaa... line 2
aaaaaaaaaaaa... line 3
...
bbbbbbbbbbbb... line 1, band 2
bbbbbbbbbbbb... line 2
bbbbbbbbbbbb... line 3
...
cccccccccccc... line 1, band 3
cccccccccccc... line 2
cccccccccccc... line 3
...
dddddddddddd... line 1, band 4
dddddddddddd... line 2
dddddddddddd... line 3
...
```

BSQ can be read with the following pseudo-code program

```
FOR EACH band
   FOR EACH line
      FOR EACH pixel
         I[pixel, line, band] = get_pixel(input);
```

Of course others are possible, like the old EROS BIP2 format (for four ba
nd MSS images) where the image is first divided into four strips.

Then each strip is stored like

aabbccddaabbccddaabbccddaabbccdd... line 1
aabbccddaabbccddaabbccddaabbccdd... line 2
...

To decode one strip the following pseudo-code can be used

```
/* The '%' character is the modulo operator */
/* Note that operations on 'i' are integer operations! */
/* Copyright 1994 by W.H. Bakker - ITC */
FOR EACH line
   FOR i=0 TO BANDS*WIDTH
      I[(i/8)*2+i%2, line, (i/2)%4] = get_pixel(input);
```

Subsequently, the strips must be glued back together.

What are the different types of image I can download/buy?
++

Very brief - needs a proper entry

Raw data (typically Level 0)
  (as with other levels, annotated with appropriate metadata). Only
  useful if you're studying the RS system itself, or data processing
  systems
Processed Images (typically Level 1, 2)
  Processing includes:
   o Radiometric correction - compensating for known
     characterisitcs of the sensor.
   o Atmospheric correction - compensating for the distortion
     (lens effect) of the atmosphere.
   o Geometric correction - referencing the image to Lat/Long
     on the Earth's surface, based on the satellite's position and
     viewing angle at the time of the acquisition. Uses either a
     spheriod model of Earth or a detailed terrain model; the
     latter enables higher precision in hills/mountains. Requires
     Ground Control Points (GCPS: points in the image which
     can be accurately located on Earth) for high precision.
  The various part-processed levels are suitable for a image
  processing studies. Most Remote Sensing and GIS applications will
  benefit from the highest level of processing available, including
  geocoding.
Geocoded Projected Imagery (typically Level 3)
  The image is mapped to a projection of the Earth, and in some
  cases also composited (ie several images are mosaiced to show a
  larger scene).

Browse Images

Images you can download from the net are likely to be browse images. These are typically GIF or JPEG format, although a number of others exist. Whilst providing a good idea of what is in an image, they are not useful for serious applications. They have the advantage of being a manageable size - generally of the order of 100Kb-1Mb (compared to 100Mb for a full scene) and are often available free. A browse version of any image (except raw data) can be made.

Stereopairs

Multitemporal Images

Do I need geocoded imagery?

++++++++++++++++++++++++++

In a recent discussion of mountain areas, John Berry (ej10jlbs@shell.com) wrote:

The problem that Frank has is that he is working in an area without adequate maps: therefore, he cannot geocode his Landsat using a DTM, because the data available is neither detailed enough or accurate enough to use as an input.

He can georegister the imagery using using one or two accurately located ground control points and the corner-point positions given in the image header: these are calculated from ephemeris data of, usually, unknown accuracy (within +/- 1 km), but internal image geometry is good so an x,y shift and a (usually) very small rotation can take care of everything to better than the accuracy of his maps. Positions used should be topographically low, and at the same elevation. GPS is the best solution, as someone else pointed out, if Frank can get in the field.

The next problem is the parallax error introduced by the high relief. In his situation, the only answer* is to get SPOT stereopairs and make a DTM or DEM from them. Except in the case of very narrow gorges or slopes steeper than 60 deg. there should be few problems with carefully chosen images (high sun angles, etc). ERDAS has an excellent module for doing this. However, I doubt that Frank has the budget. I believe ERDAS's Ortho module would then allow Frank to make an Ortho image that would be a perfectly good map.

*there may be some LFC or Russian stereo coverage in this area, which would be a lot cheaper than SPOT but would require the use of analog stereo comparators (probably).

Even if there were good topographic contour maps for all of Frank's area, the cost of digitising these and turning them into a usable DTM would probably be prohibitive (though there are outfits in Russia who might be able to quote a price affordable to a large western company).

Imaging Instruments
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How do Remote Sensing Instruments work?
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If you put a camera into orbit and point it at the Earth, you will get images. If it is a digital camera, you will get digital images.

Of course, this simplistic view is not the whole story.

Digital images comprise two-dimensional arrays of pixels. Each pixel is a sensor's measurement of the albedo (brightness) of some point or small area of the Earth's surface (or atmosphere, in the case of clouds). Hence a two-dimensional array of sensors will yield a two-dimensional image. However, this design philosophy presents practical problems: a useful image size of 1000x1000 pixels requires an array of one million sensors, along with the corresponding circuitry and power supply, in an environment far from repair and maintenence!

Such devices (charge coupled deices) do exist, and are essentially similar to analogue film cameras. However, the more usual approach for Earth Observation is the use of tracking instruments:

Tracking Instruments
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1. A tracking instrument may use a one-dimensional array of sensors - one thousand rather than one million - perpendicular to the direction of the satellite's motion. Such instruments instantaneously view a line. A two-dimensional image is generated by the satellite's movement, as each line is offset from its predecessor. If the sampling frequency is equal to the satellite's velocity divided by the sensor's field of view, lines scanned will be contiguous and non-overlapping (although this is of course not an essential property).
   btw, would the above be better expressed in some ASCII representation of mathematical notation?
2. Another approach is to use just a single sensor. It is now not sufficient to use the satellite's motion to generate an image: cross-track scanning must also be synthesised. This is accomplished by means of a rotating mirror, imaging a line perpendicular to the satellite motion. This is somewhat analagous to the synthesis of television pictures by CRT, although the rotating mirror is a mechanical (as opposed to electromagnetic) device.

   As the sensor now requires a large number of samples per line, the sampling frequency necessary for unbroken coverage is proportionally increased, to the extent that it becomes a design constraint. A typical Earth Observation satellite moves at about 6.5

Km/sec, so a 100m footprint requires 65 lines per second, and higher resolution imagery proportionally more. This in turn implies a sampling rate of 65,000 per second for a 1000-pixel swath. This may be alleviated by scanning several lines simultaneously.

Either design of scanning instrument may have colour vision (ie be sensitive to more wavelength of light) by using multiple sensors in parallel, each responding to one of the wavelengths required.

Orbits
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Satellite Orbital Elements
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Thanks to Peter Bolton (pbolton@clyde.pc.my) for this one!

Jonathan's Space Report is at
http://hea-www.harvard.edu/QEDT/jcm/jsr.html. The introduction:

The Space Report ("JSR") is issued about once a week. It describes all space launches, including both piloted missions and automated satellites. Back issues are available by FTP from sao-ftp.harvard.edu in directory pub/jcm/space/news. To receive the JSR each week by direct email, send a message to the editor, Jonathan McDowell, at jcm@urania.harvard.edu. Feel free to reproduce the JSR as long as you're not doing it for profit. If you are doing so regularly, please inform Jonathan by email. Comments, suggestions, and corrections are encouraged.

How do I convert Landsat Path/Row to Lat/Long?
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In response to this question, Wim Bakker wrote:

The SATCOV program is available by anonymous FTP from sun_01.itc.nl (192.87.16.8). Here's how to get it:

```
$ ftp 192.87.16.8
Name: ftp
Password: your-email-address
ftp> bin
ftp> idle 7200
ftp> prompt
ftp> cd /pub/satcov
ftp> mget *
ftp> bye
$
```

If you can't use FTP, drop me a line and I will send a uuencoded version by email.

Those of you who prefer a WWW interface can obtain it from the following URL:
    http://hp24.itc.nl/~bakker/satcov
Don't forget to set the "Load to local disk" option.

SATCOV is a PC program for converting Path/Row numbers of Landsat and K/J of SPOT to Lat/Lon and vice versa. Furthermore it can predict the orbits of the NOAA satellites, although I wouldn't recommend it for this purpose! But that's an other can of worms....

How is satellite data recieved on the ground?
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Intro to Ground Recieving Stations contributed by Peter Bolton
<pbolton@clyde.pc.my>

1. GROUND RECEIVING STATIONS

This document is an introduction to Ground Receiving Station (GRS) acquisition and processing of remote sensing satellites data such as SPOT, LANDSAT TM and ERS-1 SAR. Ground receiving stations regularly receive data from various satellites so as to provide data over a selected areas (a footprints approximately covers a radius of 2500 Km at an antennae elevation angle of 5 degrees.) on medium such as computer tape, diskette or film, and/or at a specific scale on photographic paper. GRS are normally operated on a commercial basis of standard agreements between the satellite operators and the Governments of the countries in which they are situated. Subject to the operating agreements, local GRSs sell products adapted to end users needs, and provide remote sensing training, cartography, and thematic applications.

2. GROUND RECEIVING STATION ARCHITECTURE

A Ground Receiving Station consists of a Data Acquisition System (DAS), a Data Processing (DPS) and a Data Archive Center (DAC).

2.1. DATA ACQUISITION SYSTEM

DAS provides a complete capability to track and receive data from the remote sensing satellite using an X/S-band receiving and autotracking system on a 10 to 13meter antenna in cassegranian configuration. DAS normally store fully demodulated image data and auxiliary data on High Density Digital Tapes (HDDTs). However, in one small UNIX based system, data storage can be stored directly on disk and/or electronically transmitted to distant archives.

2.2. DATA PROCESSING SYSTEM

DPS keeps an inventory of each satellite pass, with quality assessment and catalog archival, and by reading the raw data from HDDTs,

radiometrically and geometrically corrects the satellite image data.

2.3.DATA ARCHIVE CENTRE

The Data Archive closely related to DPS offers a catalog interrogation system and image processing capabilities through an Image Processing System (IPS).

3. GROUND RECEIVING STATION PRODUCTS

The GRS products can either be standard or value added products. Both are delivered on Computer Compatible Tapes (CCTs), CD ROM, cartridges, photographic films or photographic paper prints at scales of 1:250 000, 1:100 000, 1:50 000 and 1:25000.

i. Standard products
- SPOT-1 and 2/HRV : data of CNES levels 0, 1A, 1B, 2A
- Landsat TM : data of LTWG levels 0, 5,
- ERS-1 SAR : Fast Delivery and Complex products.

ii. Value added products
- For SPOT
  - P + XS : Panchromatic plus multi-spectral,
  - SAT : a scene shifted along the track,
  - RE : a product made of 2 consecutively acquired scenes,
  - Bi-HRV : Digital mosaic produced by assembling 2 sets of
2 scenes acquired in the twin-HRV configuration.
  - Stereoscopy : Digital terrain model (DTM) generation,
  - Levels 2B, S and level 3B using DTMs.

- For Landsat TM: levels 6, S and 7.
- For ERS-1 SAR : geocoded data.

- For any instrument:
  - Image enhancement and thematic assistance,
  - Geocoded products on an area of interest defined by the customer (projection, scale, geocoding and mosaicking according to the local map grid).

4. GROUND RECEIVING STATION OPERATION

Persons needing images for thematic applications in the field of cartography, geology, oceanography or intelligence, etc, will refer to the station catalog in order to find out if the data are available over the area concerned.

There are two possibilities :

The data exists.

The customer fills in a purchase order and is then provided with the product on a medium such as CCT, film or paper print. If the data are available in the GRS catalog, a list of the related scenes and their hardcopies (named "quick looks") are provided.

The data does not exist.

a) For SPOT, the customer fills in a programming request form which is sent by GRS to the Mission Control Centre (MCC) in Toulouse, France. MCC returns a Programming Proposal to be submitted for approval. Upon approval, the confirmation is returned to MCC which in turn sends a programming order to the satellite for emitting the data during its pass over the GRS antenna.
At the same time, MCC sends to GRS, the satellite ephemerides for antenna pointing and satellite tracking.
In the case of SPOT, if the data does not exist within the Station catalog but are listed in the SPOT IMAGE worldwide catalog, GRS may request the level O product from SPOT IMAGE in TOULOUSE in order to process it locally.

b) For other sensors, LANDSAT TM or ERS-1, the satellite ephemerides are known at GRS and the antenna is pointed accordingly in order to track all selected passes.

Within the GRS, the raw satellite data are received by the Data Acquisition System (DAS), and recorded on High Density Digital Tapes (HDDTs). HDDTs are then sent to the Data Processing System (DPS), where an update of the Station catalog is made as well as a quick look processing.

DPS is also in charge of automatic processing of selected raw data in order to produce images of standard level.

Value added products with cartographic precision are produced within DPS using interpretation workstations which must be part of an operational Geographic Information System (GIS) combined to an Image Processing System (IPS).

Once processed, the data, on CCT, are sent to the Data Archive Center (DAC) where they are delivered to the customers after a quality checking. At DAC, further processing may be applied to the data such as image stretching, statistical analysis, DTM, or a conversion from tape to film and paper prints in the photographic laboratory; "customized services" may also be offered.

Image Interpretation

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How can I assess my results?

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Michael Joy (mjoy@geog.ubc.ca) posted a question about Contingency table statistics and coefficients, and subsequently summarised replies:

Second, a summary of responses to my posting about contingency table statistics and coefficients. Basically, I need to come up with a single statistic for an error matrix, along the lines of PCC or Kappa, but which takes into account the fact that some miscalssifications are better or worse than others.

Tom Kompare suggested readings on errors of omission or commission.
Chris Hermenson suggested Spearman's rank correlation.
Nick Kew suggested information-theoretic measures.

Others expressed interest in the results; I'll keep them posted in future.

The responses are summarized below.

==========

Michael:

Your thinking is halfway there. Check out how to use an error matrix to get
+ errors
of Omission and Commission.

Good texts that explain it are:

Introduction to Remote Sensing, James Campbell, 1987, Gulliford Press
start reading on page 342

Introductory Digital Image Processing, John Jensen, 1986, Prentice-Hall
start reading on page 228 or so.

These are the books where I learned how to use them. Sorry if you don't have
+ access
to them, I don't know how Canadian libraries are.

Tom Kompare
GIS/RS Specialist
Illinois Natural History Survey
Champaign, Illinois, USA
email: kompare@sundance.igis.uiuc.edu
WWW: http://www.inhs.uiuc.edu:70/

==========

Excerpt from my response to Tom Kompare (any comments welcome...)

These are useful readings describing error matrices and various measures we can get from them, eg PCC, Kappa, omission/commission errors. But from these

+ readings
I do not see a single statistic I can use to summarize the
whole matrix, which takes into account the idea that some misclassifications
are worse than others (at least for me). For example, if I have two error
matrices with the same PCC, but with tendencies to confuse different categories,
I'd like to get a ststistic which selects the 'best' matrix (ie the best image).
One simple way I can think of to do this is to supply a matrix which gives
a 'score' for each classification or misclassification, and then multiply each
number in the error matrix by the corresponding number in the 'score' matrix.
So a very simple example of such a matrix might look like this:

	Deciduous	Conifer	Water
Decid	1.0	0.5	0.0
Conifer	0.5	1.0	0.0
Water	0.0	0.0	1.0

In this notation, the 'score' matrix for a PCC statistic would be a diagonal
matrix of "1". Obviously there are a number of issues for me to think about
in using such a matrix, eg can you 'normalize' the score matrix? Can you
use it to compare different matrices with different numbers of categories?
An obvious extension to this would be to apply this idea to the Kappa
statistic as well.

==========

Hi Michael;

Spearman's rank correlation is often used to test correlation in a situation
where you are scoring multiple test results. You might be able to adapt
it to your problem.

Chris Hermansen
Voice: 1 604 733 0731
FAX: 1 604 733 0634
clh@tfic.bc.ca

Timberline Forest Inventory Consultants
302 - 958 West 8th Avenue
Vancouver B.C. CANADA
V5Z 1E5

C'est ma facon de parler.

==========

Hi,

Your question touches on precisely the field of research I'd like to be
pursuing, if only someone would fund it:)

> Hi,
> I'm comparing different datasets using contingency tables, and I would
> like to come up with summary statistics for each comparison. I am using
> the standard PCC and Kappa, but I'd also like to come up with a measure
> which somehow takes into account different 'degrees' of misclassification.
> For example, a deciduous stand misclassified as a mixed stand is not as
> bad as a deciduous stand misclassified as water.

I would strongly suggest you consider using information-theoretic measures. The basic premise is to measure information (or entropy) in a confusion matrix. I can send you a paper describing in some detail how I did this in the not-totally-unrelated field of speech recognition.

This does not directly address the problem of 'degrees of misclassification' - just how well it can be used to do so is one of the questions wanting further research. However, there are several good reasons to use it:

1) It does address the problem to the extent that it reflects the statistical distribution of misclassifications. Hence in two classifications with the same percent correct, one in which all misclassifications are between deciduous and mixed stands will score better than one in which misclassifications are broadly distributed between all classes. Relative Information is probably the best general purpose measure here.

2) By extension of (1), it will support detailed analysis of hierarchical classification schemes. This may be less relevant to you than it was to me, but consider two classifiers:

A: Your classifier - which for the sake of argument I'll assume has deciduous, coniferous and mixed woodland classes.
B: A coarser version of A, having just a single woodland class.

Now using %correct, you will get a higher score for B than for A - the comparison is meaningless. By contrast, using information (Absolute, not Relative in this case), A will score higher than B. You can directly measure the information in the refinement from B to A.

> In effect I guess I'm
> thinking that each type of misclassification would get a different 'score',
> maybe ranging from 0 (really bad misclassification) to 1 (correct
> classification).

I've thought a little about this, as have many others. The main problem is, you're going to end up with a lot of arbitrary numerical coefficients, and no objective way to determine whether they are 'sensible'. Fuzzy measures can be used, but these are not easy to work with, and have (AFAIK) produced little in the way of results in statistical classification problems.

> I can invent my own 'statistic' to measure this, but if there are any such
> measures available I'd like to use them. Any ideas?

Take the above or leave it, but let me know what you end up doing!

Nick Kew
nick@mail.esrin.esa.it

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Michael Joy mjoy@geog.ubc.ca
University of British Columbia, Vancouver, B.C., Canada

Is there a program to compute Kappa coefficients?
++

Dipak Ram Paudyal (dipak@ait.ac.th) has written such a program (DOS only), and by popular request made it available by anonymous ftp:

I have put the program to calculate the Kappa Statistics. The program name is kappa.exe in the \pub\dos directory.

The IP address is : 202.8.65.67
The program can be downloaded with anonymous ftp in binary mode.

The program runs under DOS on typing Kappa. The READ.ME file in the same directory provides information to run the program.

How good are classification results in practice?
++
The following detailed commentary was posted by Chris Hermansen (clh@tfic.bc.ca).

Mike Joy posted a question regarding irregularities between two classifications, one derived from manual interpretation of large-scale aerial photography, the other from a supervised and enhanced spectral classification of Landsat TM imagery.

I've read several of the responses, and I just thought it time to kick in my $0.02 worth, since I am quite familiar with both of the classifications with which Mike is working.

First, Peter Bolton rattles off his experience in tropical forests and chastises Mike for discovering what should have been obvious. Well, Peter, the boreal forest is a much different beast than what you're used to in Malaysia (I can attest from firsthand experience in both cases). Classification from remotely sensed data is generally quite reliable in the boreal forest, especially given the vegetative nature of the TM-derived classification that is Mike's second dataset. Detecting predominantly deciduous from predominantly coniferous stands is (spectrally speaking) pretty straightforward. Problems arise in mixedwood stands, however, since the nature of the classification of proportion is not necessarily the same and in any case any aggregative techniques applied to the TM image prior to classification (eg smoothing) could significantly alter the proportional balance. Also, depending on the proportion of deciduous in a predominantly coniferous stand, and the spatial distribution of deciduous trees within that stand, the classifier may have difficulty detecting the differences between mixedwood and younger pure coniferous types. Furthermore, deciduous stands with coniferous understory are classified as deciduous in Mike's first dataset but may easily be interpreted as mixedwood stands in the TM image.

Secondly, on the subject of incorporation of field data, Mike's second dataset has some ground truthing incorporated in the classification.

Thirdly, on the subject of large numbers of classes in some people's TM-derived classifications, remember that in many cases these additional classes are derived by incorporating other datasets (field measurements, other digital map data, DEM information, etc). The people I've seen most test this envelope are the folks at Pacific Meridan Resources; their TM-derived datasets form only the first step of several. As Vincent Simonneaux points out, most people stop at the first step.

So, in response to Mike's original questions:

> 1) Is it reasonable to expect a TM-based classification to accurately
> distinguish Coniferous and Deciduous forest? The area I am dealing
> with is boreal mixedwood forest in northeren Alberta, Canada. I had
> expected that the classification should at least be able to do this.

On the face of it, yes. But! You must ensure that your definition of Coniferous and Deciduous forest is exactly the same in both cases (and the prevailing definitions in use in Alberta don't exactly help out in this case).

> 2) Do people out there have similar experiences, i.e. the actual
>classification
> accuracy being very much lower than the reported results, or major
> differences when comparing with different source of information?

Of course, this is a possibility; the most unreliable classes may interfere in a nasty way between to datasets. You really need to ensure that you are sampling the same population in both cases; then you need to examine the distribution of errors among classes in both cases. In your first dataset, you don't really have error estimates with which to work.

> I
> understand that an air-photo-based forest inventory and a TM satellite
>image
> are measuring different things, and that I shouldnt expect perfect
>agreement,
> but I would have thought they could agree roughly on the overall area of
> Coniferous or Deciduous forest. Ditto for two similar TM-based
> + classifications.

Once more, not necessarily. See the points above on coniferous understory in deciduous stands and the basic definitions of coniferous/deciduous split.

There are, of course, really obvious errors that can occur, like using pre-leaf or post-leaf images when trying to locate deciduous stands...

Sorry to go on at such length about this; I hope that my comments are of interest to some of you.

From: Nick.Kew@plod.esrin.esa.it (Nick.Kew)
Date: Fri, 28 Apr 1995 21:17:24 +0000
Newsgroups: comp.infosystems.gis,sci.geo.meteorology
Subject: Satellite Imagery FAQ - 4/5

Archive-name: Satellite-Imagery-FAQ-4/5
Satellite Information

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Almaz
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Russian SAR imagery, ground resolution believed to be up to 15m. Images approx 40Km square. Available in four standard levels. Brief technical information is at http://gds.esrin.esa.it/T0xc1cce622_0x000053d8. Product details are at http://gds.esrin.esa.it/Ceuri.almaz.

ERS-1
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ERS-1, the first European Remote Sensing Satellite, was launched by ESA in July 1991.

Stop press: reorganisation of Esrin's pages invalidates former links under "services". GDS links, including the ERS-1 mission front page at http://gds.esrin.esa.it/Ceuro_ers still work.

This now includes ERS-1 FAQ, mission information, applications & bibliography, imagery and services. Further information, including Earth Observation Quarterly continue to be available through http://services.esrin.esa.it.

Online browsing of ERS-1 SAR images is available through Esrin's Multi-Mission Browse Service (MMBS) at http://tracy.esrin.esa.it:8000/

For ground station availability, see http://sloth.esrin.esa.it/gsstatus.html

Reference:
ERS User Handbook, esa SP-1148, ed. Bruce Battrick ISSN 0379-6566 ISBN 92-9092-029-7 published by ESA-ESTEC, Nordwijk, NL.

ERS-2
+++++

Extensive set of WWW pages unveiled just before the April 21st Launch under http://services.esrin.esa.it/ including daily reports during calibration phase. The new GOME equipment is described under http://gds.esrin.esa.it/Ccal_val_gome.

JERS-1
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Japanese Earth Resources Satellite -1
NASDA's WWW page on this satellite is at http://hdsn.eoc.nasda.go.jp/guide/guide/satellite/satdata/jers_e.html and includes brief details & a couple of images.

Sensor Characteristics
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http://gds.esrin.esa.it/CEURI.APP3.JERS1

OPS (Optical) Imagery - Online Browse
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http://tracy.esrin.esa.it:8000/

KOSMOS
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Russian imagery; currently the highest spatial resolution of any available. The KVR-1000 camera produces imagery at up to 2-meter resolution (panchromatic). There are online samples at http://cen.cenet.com/htmls/d2/sate.htm.

A fine sample in the Eurimage 1995 calender shows KVR-1000 combined with Landsat TM to give the effect of ultra-high-resolution colour imagery. The TK-350 camera offers 10-meter resolution, and stereo capabilities.

Technical information on the net is (AFAIK) sparse, but Ivan Krasnyj (ivan@krasnyj.spb.su) posted the following:

TK-350 (Topographic Camera) has high measuring characteristics. The images obtained by this camera have 10 m ground resolution, average scale is 1:660000, image size is 30x45 cm, one image covers the area 200x300 km, and longitudinal stereoscopic overlap is 60% or 80%.

Stereoscopic overlap of TK-350 camera images (maximum value of B/H ratio is close to 1) provides the obtaining of ground

relief mean error of 7 m, which is more better than for other existing systems.

The image can be enlarged up to 1:50000 scale.

KVR-1000.

KVR-1000 (High Resolution Camera) can work together with TK-350 and provides the obtaining of the images with 2 m ground resolution, 1:220000 average scale, image size is 18x18 cm, and one image covers area 40x40 km. Camera works in panchromatic spectral range. The materials obtained by means of KVR-1000 let one to perform the detailed identification of the area of shooting. The images can be enlarged up to 1:10000 scale without significant loss of quality, which makes possible to create on their basis photomaps, photoplans and other products of scale 1:10000 and smaller.

Joint use of photo materials made by TK-350 and KVR-1000 cameras together with the numerical measuring parameters, which are registered at the moment of shooting, let one to perform photogrammetric processing and to create topographic and photomaps of 1:50000 scale and smaller. It is possible to create maps practically of any region of the Earth surface, including the territories, where geodetic reference network is unavailable.

Images can be delivered in the form of film, paper print and as digital data.

Landsat
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Landsat's mission is "to provide for repetitive acquisition of high resolution multispectral data of the earth's surface on a global basis". Landsat is the "classic" Earth Observation satellite, dating back to 1972. The MSS (Multispectral Scanner) instrument provides visible/infrared imagery at 80m resolution; the TM (Thematic Mapper), first deployed on Landsat 4 in 1982, improves this to 20-30m.

Comprehensive guides are available at
http://sun1.cr.usgs.gov/glis/hyper/guide/landsat.

http://sun1.cr.usgs.gov/glis/hyper/guide/landsat_tm.

World-map based WWW browsing of Landsat TM imagery is available from href=http:tracy.esrin.esa.it:8000 or http://www.coresw.com.

1982-1985 TM, and 1972-1992 MSS data are available at reduced prices from USGS. See http://sun1.cr.usgs.gov/glis/hyper/news/tm.html.

Meteosat

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Meteosat homepage is at http://gds.esrin.esa.it/Cmeteosat

Nimbus
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Description and imagery at http://gds.esrin.esa.it/CNIMBUS

(AFAIK) most noted for the CZCS ocean colour and other marine maps. This data is available in a variety of net locations and on CDROM. See the SeaWiFS project's pages at http://seawifs.gsfc.nasa.gov/SEAWIFS/IMAGES/CZCS.html

NOAA Polar Orbiting Environmental Satellites (POES)
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This long-running (1978-) series of satellites carry the AVHRR instrument. A passive visible/infrared instrument imaging a broad (2400Km) swath, this is the most widely used of any in large-area (including continental and global scale) Earth Observation.

There is a comprehensive guide to AVHRR imagery at http://sun1.cr.usgs.gov/glis/hyper/guide/avhrr.

Sources for AVHRR data on the net are numerous - here are a few:

1. (near) real-time: (see also Weather Pics)

   http://www.rsmas.miami.edu/images.html
   Rosenstiel School of Marine and Atmospheric Science
   "Global Satellite Imagery"

2. Datasets (see also Whole-World Images)

   http://sun1.cr.usgs.gov/landdaac/landdaac.html
   USGS/EDC Land DAAC
   http://shark1.esrin.esa.it/
   Ionia browser from ESA/ESRIN
   http://xtreme.gsfc.nasa.gov/
   Land Pathfinder from NASA/GSFC.
   http://sst-www.jpl.nasa.gov/
   SST Pathfinder from NASA/JPL
   http://pegasus.nesdi s.noaa.gov//pathfinder.html
   Atmosphere pathfinder from NOAA
   http://www.grdl.noaa.gov/
   NOAA Satellite Active Archive (DAAC)
   http://geochange.er.usgs.gov/pub/magsst/magsst.html
   Modern Average Global Sea Surface Temperature (USGS)

SeaStar
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Ocean colour monitoring satellite; successor to CZCS(Nimbus). SeaWiFS - High temporal and spectral resolution optical instrument.

Comprehensive information on homepage at
http://seawifs.gsfc.nasa.gov/scripts/SEAWIFS.html.

Shuttle
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The principal Earth Observation missions (AFAIK) are Imaging Radar. There is also a collection of Earth Observation imagery at NASA/JSC
http://images.jsc.nasa.gov/html/home.htm

Shuttle Imaging Radar
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Spaceborne Imaging Radar-C/X-Band Synthetic Aperture Radar
The most recent Shuttle Imaging Radar mission is a joint venture of NASA and the German and Italian national space agencies. It is equipped with an advanced imaging radar operating at three different wavelengths, and a variable viewing angle. SIR-C missions took place in April and October 1994. Possibly the most complete single introduction is at
http://www.op.dlr.de/ne-hf/projects/sircdesc.html.

Online Reference:

- o NASA JPL have an excellent imaging radar homepage at http://southport.jpl.nasa.gov/, the serious contents of which is at http://southport.jpl.nasa.gov/scienceapps.html. Links from this page include information and browse images, and also an interactive ++ bulletin board (nice)! for discussion of imaging radar.
- o DLR have a SIR-C/X-SAR page http://www.op.dlr.de/ne-hf/SRL.html, containing general and mission information and online imagery.
- o USGS/EDC have a SIR-C/X-SAR page at http://sun1.cr.usgs.gov/landdaac/sir-c/sir-c.html, with general information and browse facility.

There is also a new browser at
Http://ic-www.arc.nasa.gov/ic/projects/bayes-group/Atlas/Earth/.
However, it refused to serve me images: someone tell me whether it's broken or whether I have a problem?

RADARSAT
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Note: They may still be inviting proposals for scientific studies with this - check it out!

Canadian Space Agency's major Earth Observation satellite, due for 1995 launch. Pending a proper entry here, see their homepage at http://adro.radar1.sp-agency.ca/adrohomepage.html. It's good and comprehensive, but slow!

Satellite Probatoire pour L'Osservation de la Terre (SPOT)
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The french SPOT satellites provide high-resolution visual/infrared Earth Observation imagery. At 10m (Panchromatic) / 20m (Multispectral), SPOT imagery offers higher resolution than the major alternative Landsat. In addition, SPOT is the leading provider of stereoscopic (3-dimensional) imagery.

There is a comprehensive guide to SPOT at http://sun1.cr.usgs.gov/glis/hyper/guide/spot.

Browsing SPOT imagery can be challenging (but check out http://www.coresw.com/. Spot Image's DALI catalogue system provides the facility, but may not be convenient to all users. Online access to DALI is available, as noted by Wim Bakker after a rather extended discussion on the List:

HERE'S HOW TO ACCESS DALI

Follow the URL:
telnet://esapid@epocat.esrin.esa.it
(TELNET to epocat.esrin.esa.it username 'esapid')

Answer the questions like
Enter FAMILY name (minimum 6 chars) :
Enter FIRST name (minimum 6 chars) :
^^^^^^^^^^^^^^^(my first name doesn't even have 6 chars! :-)

>From the MAIN_MENU choose:
2. DATA SYSTEM/ARCHIVE descriptions.

Under the DC_QUERY enter:
System / Archive
(2) Short Name (Acronym) [DALI]

Under DC_DISPLAY enter:
LINK

The following text will appear:
==========

Attempting to connect to the DALI node ...

You are being connected to the DALI SPOT IMAGE catalogue.

Enter:
Username : QLEMAST
Password : MASTER

To connect to the catalogue, write at the prompt ('>')
CON CAT .
Make sure you type the space and period " ." at the end of the command.

Only one user at the same time can access to the catalogue, so if you
do not arrive to access try later.

You can now perform searches of the database.
A simple example of a search is given below. For other information,
refer to the "Type 3 Consultation Station User's Manual" for SPOT IMAGE.
To have a COPY OF THE MANUAL or a PERSONNEL ACCOUNT, please contact
Marie Rousselot at SPOT IMAGE.

Exit from the DALI system by typing (with space and period):
DIS .
which is short for DISconnect. You will be returned back to this
screen in the ESAPID.

Example of search,
Type:

SE GEO KJ 066/316 CRI DA FR 1991/07/01 TI 10:18 TO 1991/07/01 TI 10:19 .
Again, you must put a space and period " ." at the end of the search command.

The above command is an example from the SPOT IMAGE Manual and means "SElect
GEOgraphic KJ k/j CRIteria FRom YYYY/MM/DD TIme HH:MM TO YYYY/MM/DD TIme
HH:MM."

There are many other ways to search the database that are outlined in the
manual. The search results will be displayed on the screen. The user manual
explains the various output parameters.

%PAD-I-COM, call connected to remote DTE

ACCESS TO THIS SYSTEM IS SUBJECT TO PRIOR AUTHORIZATION ,
AND IS THEREFORE PROHIBITED TO NON AUTHORIZED PERSONS.

CE SYSTEME EST RESERVE AUX USAGERS HABILITES

ET INTERDIT AUX AUTRES UTILISATEURS.

S I / D P S T / S I

Username : QLEMAST
Password : MASTER

==========

At long last, you're in!

In addition to using the 'LINK' facility via ESA it must be possible
to connect via the American or Asian sites of the CEOS IDN:

telnet://nodis@nssdca.gsfc.nasa.gov
telnet://nasdadir@nsaeoc.eoc.nasda.go.jp

TOPEX/POSEIDON
++++++++++++++

Details and imagery at the homepage http://topex-www.jpl.nasa.gov/

Tropical Rainfall Measuring Mission (TRMM)
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See http://ame.gsfc.nasa.gov/tsdis/tsdis.html

From: Nick.Kew@plod.esrin.esa.it (Nick.Kew)
Date: Fri, 28 Apr 1995 21:17:33 +0000
Newsgroups: comp.infosystems.gis,sci.geo.meteorology
Subject: Satellite Imagery FAQ - 5/5

Archive-name: Satellite-Imagery-FAQ-5/5
Further Reading

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Is there a good general introduction to Remote Sensing on the Net?

++

Watch this space!!!!

I have a question that isn't covered in the FAQ

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1. Look in the CEOS IDN. This is the authoritative worldwide information system that answers every possible question about Satellite Earth Observation. The IDN has three coordinating nodes, each carrying the complete directory:

   America
   The Global Change Master Directory is accessible by WWW at http://gcmd.gsfc.nasa.gov/ or by telnet to gcmd.gsfc.nasa.gov (login as "gcdir").
   Europe
   The IDN is available via Hyper-G or WWW via Esrin's GDS at http://gds.esrin.esa.it/CCEOS-IDN or by telnet to epocat.esrin.esa.it (login as "esapid").
   Asia
   The IDN is available by telnet to NASDA at nsaeoc.eoc.nasda.go.jp.

2. Look in Esrin's GDS (URL below). Supports browsing, or keyword search types of access.
3. Look in USGS's www-glis (URL below). A major source of detailed information.

Related FAQs

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http://www.census.gov/geo/gis/faq-index.html
  The comp.infosystems.gis FAQ
ftp://eos.nasa.gov/EosDis/sci.geo.eos
  Archive and FAQ for sci.geo.eos
gopher://una.hh.lib.umich.edu/00/inetdirsstacks/earthsci%3athoen
  Bill Thoen's Earth Science Resources FAQ
http://www.cis.ohio-state.edu/hypertext/faq/usenet/weather/top.html
  Ilana Stern's Meteorology FAQ
ftp://kepler.gps.caltech.edu/pub/terrill/rsvegfaq.txt
  Terrill Ray's Remote Sensing for Vegetation FAQ
ftp://charon.er.usgs.gov/pub/PD.projections.FAQ
  Public Domain Cartographic Software FAQ
http://fits.cv.nrao.edu/traffic/scidataformats/faq.html
  sci.data.formats FAQ

Note that FAQs within the news.answers system are automatically archived at lots of sites. The "primary" site is ftp://rtfm.mit.edu/ where FAQs are kept in plain ASCII format. Some other places to look for hypertext versions include:

o Europe: http://www.cs.ruu.nl/cgi-bin/faqwais
o America: http://www.cis.ohio-state.edu/hypertext/faq/usenet/.

Related Usenet Groups and Listservs
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(original list from Wim Bakker <

UseNet
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o bit.listserv.uigis-l
  User Interfaces for Geographic Information Systems Discussion List
o bit.listserv.wx-talk
  General weather discussions and talk
o comp.ai.vision
  Artificial Intelligence Vision Research. (Moderated)
o comp.graphics
  Computer graphics, art, animation, image processing
o comp.graphics.algorithms
  Algorithms used in producing computer graphics.
o comp.graphics.raytracing
  Ray tracing software, tools and methods.
o comp.graphics.visualization
  Info on scientific visualization.
o comp.infosystems.gis
  All aspects of Geographic Information Systems.
o comp.soft-sys.khoros
  The Khoros X11 visualization system.
o info.grass.programmer
  GRASS geographic information system programmer issues (grassp-list @moon.cecer.army.mil) (Moderated)
o info.grass.user
  GRASS geographic information system user issues (grassu-list@moon.cecer.army.mil) (Moderated)
o news.answers
  Repository for periodic USENET articles. (Moderated)
o sci.data.formats
o sci.environment
  Discussions about the environment and ecology. Not for the fainthearted!
o sci.fractals
  Objects of non-integral dimension and other chaos.
o sci.geo.earthquakes

o sci.geo.eos
NASA's Earth Observation System (EOS).
o sci.geo.fluids
Discussion of geophysical fluid dynamics.
o sci.geo.geology
Discussion of solid earth sciences.
o sci.geo.hydrology
Surface and groundwater hydrology.
o sci.geo.meteorology
Discussion of meteorology and related topics.
o sci.geo.oceanography
Oceanography
o sci.geo.petroleum
Topics related to the exploration of natural resources
o sci.geo.satellite-nav
Satellite navigation systems, especially GPS.
o sci.image.processing
Scientific image processing and analysis.
o sci.space.news
Announcements of space-related news items. (Moderated)
o sci.answers
Repository for periodic USENET articles. (Moderated)
o alt.sys.intergraph
Support for Intergraph machines.

LISTSERV and discussion lists via e-mail only
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Address to SUBSCRIBE	Address to POST TO THE LIST
=========	==========
wxsat-request@ssg.com	WXSAT-L@ssg.com
listserv@CSEARN.BITNET	IMAGRS-L@CSEARN.BITNET
(archive site: http://walleye.forestry.umn.edu:70/1/gopher/rsgisinfo/listservers/imagrs-l	
listserv@orstom.fr	AFRICAGIS@rio.org
listserv@tome.worldbank.org	AFRICA-EIS@tome.worldbank.org
met-ai-request@comp.vuw.ac.nz	met-ai@@comp.vuw.ac.nz
listserv@netcom.com	geosci-jobs@netcom.com

(Please do NOT post subscribe/unsubscribe requests to the lists. It won't have the desired effect, but it will irritate list members).

o WXSAT-L
This list serves two functions. The primary function is the distribution of NOAA status and prediction bulletins for the GOES and polar weather satellites. This data is the same data available via SCIENCEnet NOAA.SAT bulletin board area. The mail list also acts as a reflector for subscribers' comments and discussion of matters related to weather satellites, ground stations, and associated topics.
Contact: wxsat-request@ssg.com (Richard B. Emerson)

o IMAGRS-L
Digital Image Processing of Remotely Sensed Data

The area of digital image processing of remotelly sensed data should be the main topic of this club - so exactly the problems of the interest are the methods of digital image processing for remotelly sensed data (like LANDSAT or SPOT) as well as microwave and also new types of data for remote sensing the Earth or other objects. Also computer problems with these very time demanding methods can interesting including visualization, paralel computing etc.

Subscriptions should go to listserv@CSEARN.BITNET (or listserv@EARN.CVUT.CZ)
Send a message with the following body:
SUBSCRIBE IMAGRS-L add_your_full_name_here

o AFRICAGIS
Contributions should go to: africagis@rio.org
Subscriptions and commands: listserv@orstom.fr

o AFRICA-EIS rg
Another African GIS discussion group.
Contributions should go to: africa-eis@tome.worldbank.org
Subscriptions and commands: listserv@tome.worldbank.org
The first line of the message should read:
SUBSCRIBE AFRICA-EIS
add_your_full_name_here
Contact: Koffi Kouakou at kkouakou@worldbank.org

Acronyms
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I put this here after recieving a longish list from Peter Bolton (good idea - thanks Peter). I then realised it has to be a separate document to enable new entries to be merged. So it's here but may not look too good on all browsers until I fix the presentation.

Web pages
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Some of the front pages and other main pages from the people who run space programmes, and a few other sites with interesting material on the Web. But first, the major subject catalogues...

Internet Guides
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(these lists are very extensive)!
Virtual Library: Earth Sciences http://www.geo.ucalgary.ca/VL-EarthSciences.html

Virtual Library: Environment http://ecosys.drdr.virginia.edu/Environment.html
Virtual Library: Meteorology http://www.met.fu-berlin.de/DataSources/MetIndex.html
Virtual Library: Oceanography http://www.mth.uea.ac.uk/ocean/oceanography.html
EINET Galaxy Geosciences http://galaxy.einet.net/galaxy/Science/Geosciences.html

National, Government and International Organisations
++
(please feel free to comment if you disagree with my categorisations)>

Agence Francaise de l'Espace
++++++++++++++++++++++++++++
Centre National Etudes Spatiales
++++++++++++++++++++++++++++++++
CNES Homepage (french only) http://www.cnes.fr/
Earth Observation (incl SPOT) http://www.cnes.fr/scripts/observat.html

Agenzia Spaziale Italiana
+++++++++++++++++++++++++
Homepage http://hp835.mt.asi.it/

Consortium for International Earth Science Information Network (USA)
++
CIESIN Front Page http://infoserver.ciesin.org/

DLR/Deutsche Fernerkundungsdatenzentrum
++++++++++++++++++++++++++++++++++++
English Front Page http://pid.da.op.dlr.de/welcome.html
ISIS http://pid.da.op.dlr.de/ISIS/Intro.html

Environmental Resources Information Network (Australia)
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ERIN homepage http://kaos.erin.gov.au/erin.html

European Space Agency
++++++++++++++++++++
ESA Front Page http://www.esrin.esa.it/
ESRIN Front Page http://www.esrin.esa.it/htdocs/esrin/esrin.html
GDS (Guide & Directory Service) http://gds.esrin.esa.it/
UsERServices http://services.esrin.esa.it/
Ionia Browser http://shark1.esrin.esa.it/
Multi-mission Browse Service http://tracy.esrin.esa.it:8000/
(prototype: availability intermittent)availability intermittent)
European Earth Observation System http://gds.esrin.esa.it/CEEOS_ROOT
Environmental & Global Change Infoservers
http://gds.esrin.esa.it/CGCservers

European Union
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Centre for Earth Observation http://ceo-www.jrc.it/
Marine Environment Unit http://me-www.jrc.it/home.html

Instituto Nacional de Pesquisas Espaciais (Brazil)
++
Front Page http://www.inpe.br/

National Aeronautics & Space Administration (USA)
++
NASA Homepage http://www.gsfc.nasa.gov/NASA_homepage.html
NASA Internet connection http://www.jsc.nasa.gov/nasa/NASAInternet.html
NASA Pathfinder Program http://xtreme.gsfc.nasa.gov/pathfinder/
Global Change Data Center http://ame.gsfc.nasa.gov/gcdc/gcdc.html
Global Change Master Directory http://gcmd.gsfc.nasa.gov/

NASA Earth Observing System (USA)
++++++++++++++++++++++++++++++++
EOS Front Page http://eos.nasa.gov/
EOSDIS http://spso2.gsfc.nasa.gov/spso_homepage.html
MTPE Mission to Planet Earth http://www.hq.nasa.gov/office/mtpe/

The Distibuted Active Archive Centers (DAACs) are subject-oriented repositories for imagery and related info.

ASF DAAC (Polar processes) http://eosims.asf.alaska.edu:12355/asf_homepage.html
CIESIN SEDAC (social aspects) http://www.ciesin.org/SEDAC/SEDAC-home.html
EDC DAAC (Land) http://sun1.cr.usgs.gov/landdaac/landdaac.html
JPL DAAC (Oceanography) http://seazar.jpl.nasa.gov/
LARC DAAC (Atmosphere/radiation) http://eosdis.larc.nasa.gov/
MSFC DAAC (Hydrology) http://wwwdaac.msfc.nasa.gov:/
NOAA SAA (AVHRR) http://www.grdl.noaa.gov/
NSIDC DAAC (snow & ice) http://eosims.colorado.edu:1773/
ORNL DAAC (biogeochemical) http://www-eosdis.ornl.gov/
GSFC DAAC (atmosphere/biosphere) http://daac.gsfc.nasa.gov/

National Center for Atmospheric Research (USA)
++
NCAR Front Page http://www.ucar.edu/
NCAR Data Archive http://www.ucar.edu/dss/index.html

National Oceanic and Atmospheric Administration (USA)
++
NOAA Front Page http://www.noaa.gov/
NESDIS http://www.noaa.gov/nesdis/nesdis.html
National Climatic Data Center http://www.ncdc.noaa.gov/ncdc.html
National Geophysical Data Center http://www.ngdc.noaa.gov/ngdc.html
National Oceanographic Data Center http://www.nodc.noaa.gov/
NOAA Geosciences Laboratory http://www.grdl.noaa.gov/
Satellite Active Archive http://www.saa.noaa.gov/

National Space Development Agency (Japan)
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NASDA Front Page http://hdsn.eoc.nasda.go.jp/

United States Geological Survey
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USGS Front Page http://info.er.usgs.gov/
Eros Data Center http://sun1.cr.usgs.gov/eros-home.html
GLIS http://edcwww.cr.usgs.gov/glis/glis.html

A few Companies, Universities and other sites

Non-commercial
++++++++++++++
Free University of Berlin http://www.met.fu-berlin.de/english/index.html
University of Dundee http://www.sat.dundee.ac.uk/
University of Minnesota http://wwwrsl.forestry.umn.edu:10000/
Texas A&M University http://ageninfo.tamu.edu/geoscience.html
University of Hawaii http://satftp.soest.hawaii.edu/
Univ. Colorado Climate http://noaacdc.colorado.edu/cdc/cdc_home.html
Environmental Research Institute of Michigan
http://www.erim.org/
National Operational Hydrologic Remote Sensing Center
http://www.nohrsc.nws.gov/
Delft University of Technology http://dutlru8.lr.tudelft.nl/
University of Nottingham http://www.geog.nottingham.ac.uk/
University of Stuttgart http://www.ifp.uni-stuttgart.de/
IEEE Geoscience/Remote Sensing http://www.ieee.org/grs/index.html

Commercial sites with significant (real or promised) free content:
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Core SW ImageNet http://www.coresw.com/
C.E.N. Digital Satellite Images http://cen.cenet.com/htmls/d2/sate.htm
Mindlink applied geoscience http://mindlink.net/john_harrop/geology.html
Mountains West Consulting http://165.90.138.3/~tcsmith/index.html

Fully commercial - offering relevant products and/or services
++
Able Software Co http://world.std.com/~able
Clyde Consulting http://world.std.com/~able/clyde1.html
VYSOR Integration Inc http://www.synapse.net/~vysor/

Catalogues/Inventories
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Perhaps this list should be merged with the URLS?

These are catalogue login services available by telnet. Serious users of these may wish to take advantage of one of the CINTEX GUI clients - DLR ISIS, ESA UIT or NASA IMS.

CCRS: telnet gcnet.ccrs.emr.ca
Login as "gcnet"

DLR: telnet 129.247.162.47
Login as "dlrpid"

ESA: telnet epocat.esrin.esa.it
Login as "leda" (LEDA), "catalogue" (Earthnet), "esapid" (IDN)

NASA: telnet nssdca.gsfc.nasa.gov
Login as "gcdir" (GCMD/IDN), "nodis" (NODIS), "nssdc"

NASA EOS - the DAACS
ASF telnet eosims.asf.alaska.edu
EDC telnet eosims.cr.usgs.gov
GSFC telnet eosims.gsfc.nasa.gov
JPL telnet eosims.jpl.nasa.gov
LARC telnet eosims.larc.nasa.gov
MSFC telnet eosims.msfc.nasa.gov
NOAA/SAA telnet eosims.fb4.noaa.gov
NSIDC telnet eosims.colorado.edu
ORNL telnet eosims.esd.ornl.gov

NASDA telnet nsaeoc.eoc.nasda.go.jp
Login as "nasdadir" (IDN), "nasdasin" (Sinfonia)

NOAA telnet esdim1.esdim.noaa.gov
Login as noaadir

URI telnet zeno.gso.uri.edu
Login as "uricat"

USGS telnet glis.cr.usgs.gov
Login as glis

Weather Online
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(see also Weather FAQ).

Here is a list from the WWW Virtual Library (Meteorology) at FU-Berlin. http://www.met.fu-berlin.de/DataSources/MetIndex.html. I have converted the addresses to appear also in a text-only copy, in line with the rest of this FAQ.

- o ftp://plaza.aarnet.edu.au/Weather/gms GMS, from AARNet Archive Server
- o gopher://gopher.ncc.go.jp/11/INFO/weather/gms GMS ,

from National Cancer Center (Tokyo)

o gopher://gopher.ssec.wisc.edu/11/gsdc.d GOES , from University of Wisconsin-Madison
o ftp://westsat.com/pub/images GOES , from westsat.com

o ftp://cumulus.met.ed.ac.uk/images/jpeg/atlantic.ir.jpg US Satellite IR , from University of Edinburgh
o ftp://cumulus.met.ed.ac.uk/images/jpeg/atlantic.vis.jpg US Satellite VIS , from University of Edinburgh

o gopher://src.doc.ic.ac.uk/11/weather/met.ed.ac.uk/images Meteosat , from University of Edinburgh
o gopher://gopher.rrz.uni-koeln.de/11/themen/Wetter Meteosat , from Universitdt Kvln
o ftp://ccn7.nott.ac.uk/user/user/pub/satpix Meteosat , from Nottingham University

o http://www.sat.dundee.ac.uk/ NOAA-11/12 (Europe), from University of Dundee
o http://www.met.fu-berlin.de/english/Wetter/index.html NOAA (Europe), Institut flr Meteorologie FU-Berlin
o http://www.dkrz.de/sat/noaa.html NOAA (Europe) , Deutsches Klimarechenzentrum
o http://www.inpe.br/grid/meteosat Meteosat 3 (South America), from Brasilian Space Agancy (INPE)
o http://www.crs4.it/~luigi/METEO/meteo.html Meteosat, from CSP, Italy
o ftp://rainbow.physics.utoronto.ca/pub/sat_images/ NOAA-11/12 (North America) , from rainbow.physics.utoronto.ca
o gopher://gopher.ncc.go.jp/11/INFO/weather/noaa/ NOAA (Asia), from National Cancer Center (Tokyo)
o ftp://hydro.iis.u-tokyo.ac.jp/data/noaa/ NOAA (Asia), from University of Tokyo

o http://shark1.esrin.esa.it/ Ionia Global Land 1km AVHRR data Set Browser, from European Space Agency - ESA/ESRIN

Ground Stations, with CEOS IDs

(1) short code and (2) synonym expansion
ADL,Adelaide
ALS,Alice Spring
ASP,Aspendale
BAA,Buenos Aires
BDP,Budapest
BGK,Bangkok
BIO,Bedford IO

BJG,Beijing
BMH,Bremenhaven
BRL,Berlin
BRN,Berne
CPA,Cashoiera Paulista
CPH,Copenhagen
CRO,Cairo
CSY,Casey
CTX,Cotopaxi
DAR,Darwin
DBL,De Bilt
DDE,Dundee University
DKA,Dhaka
DSA,Dharan
DVW,Downsview
DXL,Da-Xing-An-Ling
EMT,Edmonton
EPO,Earthnet Programme Office
FRA,Frascati
FTZ,Fortaleza
GSF,Goddard Space Centre
GZC,Guangzhou
HBK,Hartebeestoek
HBT,Hobart
HLN,Honolulu
HMB,Hamburg
HSK,Helsinki
HYD,Hyderabad
JSA,Jeddah
KGL,Keelung
KIR,Kiruna
KKW,Krakow
KYS,Kiyose
LAP,Lapan
LNN,Centre Meteo Lannion
LSH,Lasham
LSU,Louisiana University
MCR,Malaysian RS Centre
MDD,Madrid
MMI,Miami University
MMR,MacMurdo
MNL,Manila
MPS,Maspalomas
NDH,New Delhi
NGC,Fairbanks
NMY,Niamey
NOA,Not Known
NRB,Nairobi
NRK,Norrkoping
NRS,Nairobi RS Centre

NWI,Wallops Island
OFB,Offenbach
OHG,O Higgins
OPF,DLR Oberpfaffenhoffen
OSL,Oslo
PAS,Prince Albert
PLM,Palmer Station
PRG,Prague
PTH,Perth
RMA,Meteo Office Rome
RUN,La Reunion
RWC,Redwood City
RYD,Riyadh
SAF,Pretoria
SCR,Scripps Institute
SCZ,Scanzano
SDN,Sidney
SFL,Sioux Falls
SGP,Singapore
SLG,Selangor
SL1,Seol KMS
SL2,Seoul University
SND,Sendai
SPZ,Spitzbergen
SSC,Stennis Space Centre
STG,Santiago
SYW,Syowa
TK1,Tokai University 1
TK2,Tokyo University 2
TMS,Tromso
TNB,Terranova Bay
TNS,Tunis
TOL,Aussaguel
TPI,Taipei
TRB,Traben-Trarbach
TSV,Townsville
UAL,Alaska University
URI,Rhode Island University
UTA,Texas University
UQC,Urumqi
WLT,Wellington