

Australian Preparations for GIFTS

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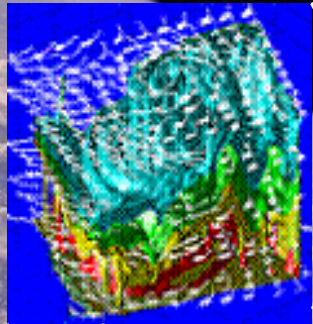
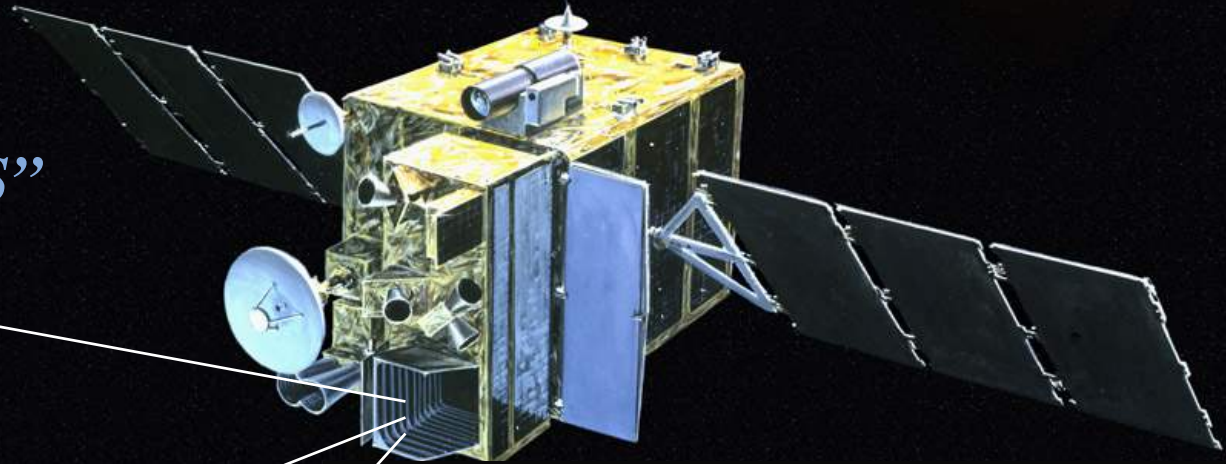
Geostationary Imaging Fourier Transform Spectrometer

GIFTS – *A revolutionary weather observation tool*

NASA , U Wisc., Utah St. U., NOAA, Navy/AF, BoM (Australia)

New Technology for Atmospheric Temperature, Moisture, Chemistry, & **Winds**

EO-3 “GIFTS”

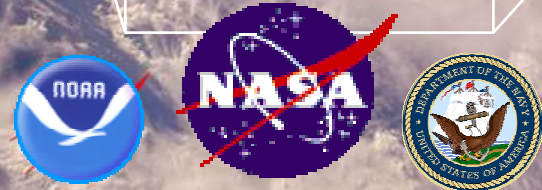


4-d Digital Camera:

Horizontal: Large area format Focal Plane detector Arrays

Vertical: Fourier Transform Spectrometer

Time: Geostationary Satellite



GIFTS Program Concept

TECHNOLOGY

Imaging Interferometer

Cryogenic Michelson Interferometer
Laser Metrology System
On-Board Calibration

LFPA and Cryogenic Cooling

128 x 128 Infrared Detector Arrays
Redundant Cryo-Coolers

High Speed Signal Processing

Rad-Hard Analog to Digital Converters
PowerPC Rad750

Data Compression

Rad-Hard Processors

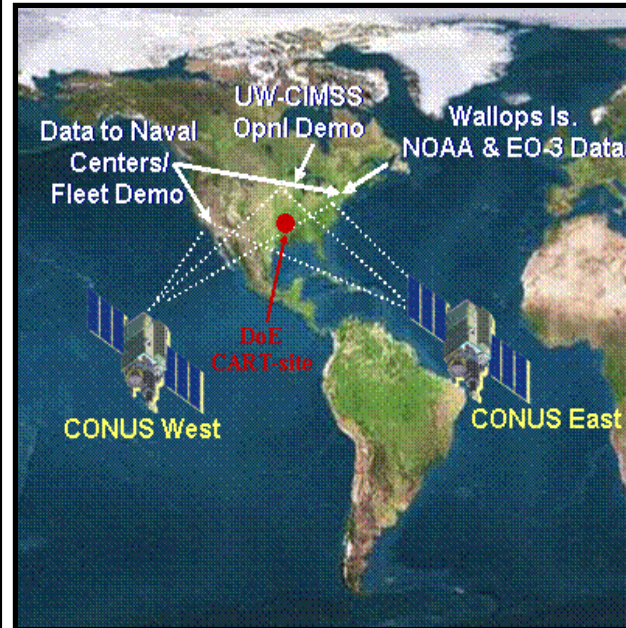
Pointing and Control

Star Tracker
512 x 512 Visible Detector Array

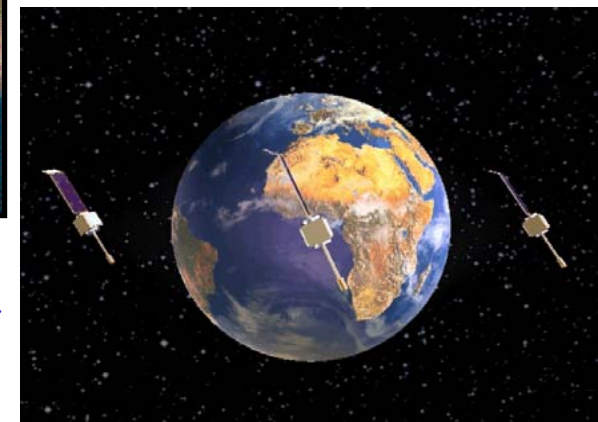
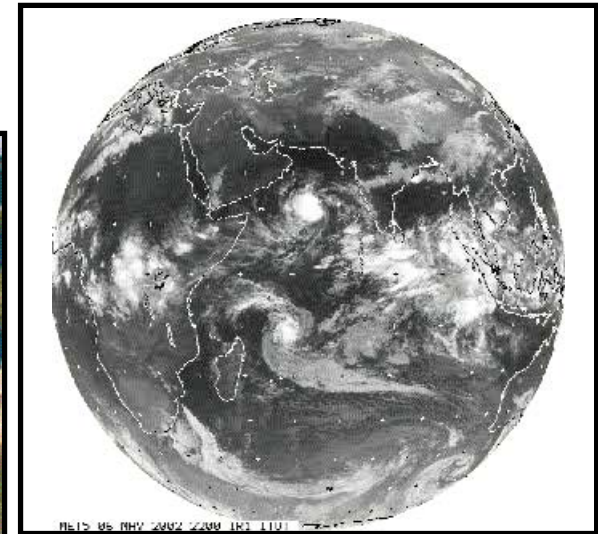
Lightweight Optics

SiC Telescope

VALIDATION



Indian Ocean Ops

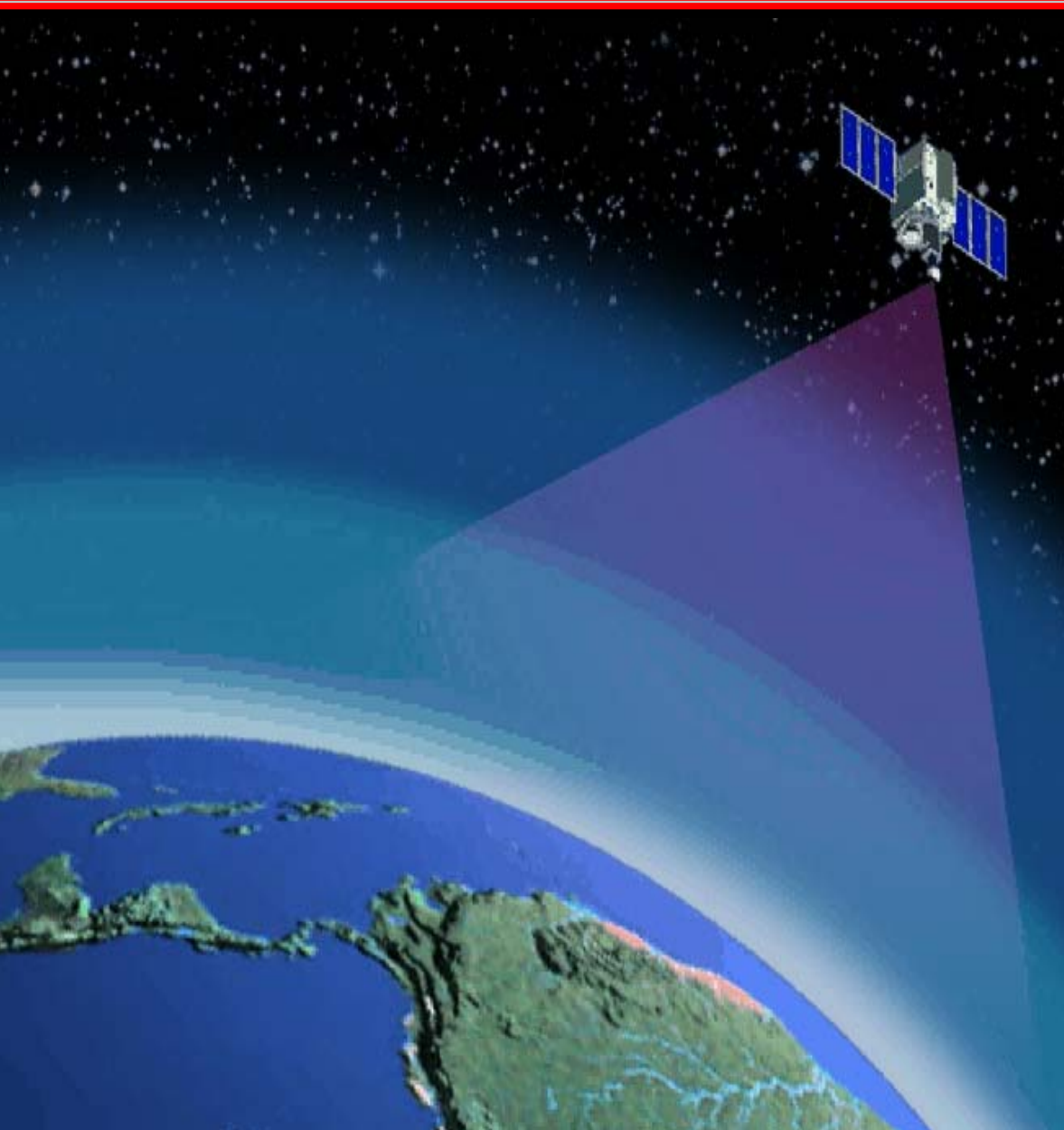


NASA - Demonstrate Wind Sounding Measurement Concept & Validate the Technologies

NOAA - Demonstrate Operational Utility & Infuses Technology into NOAA instruments

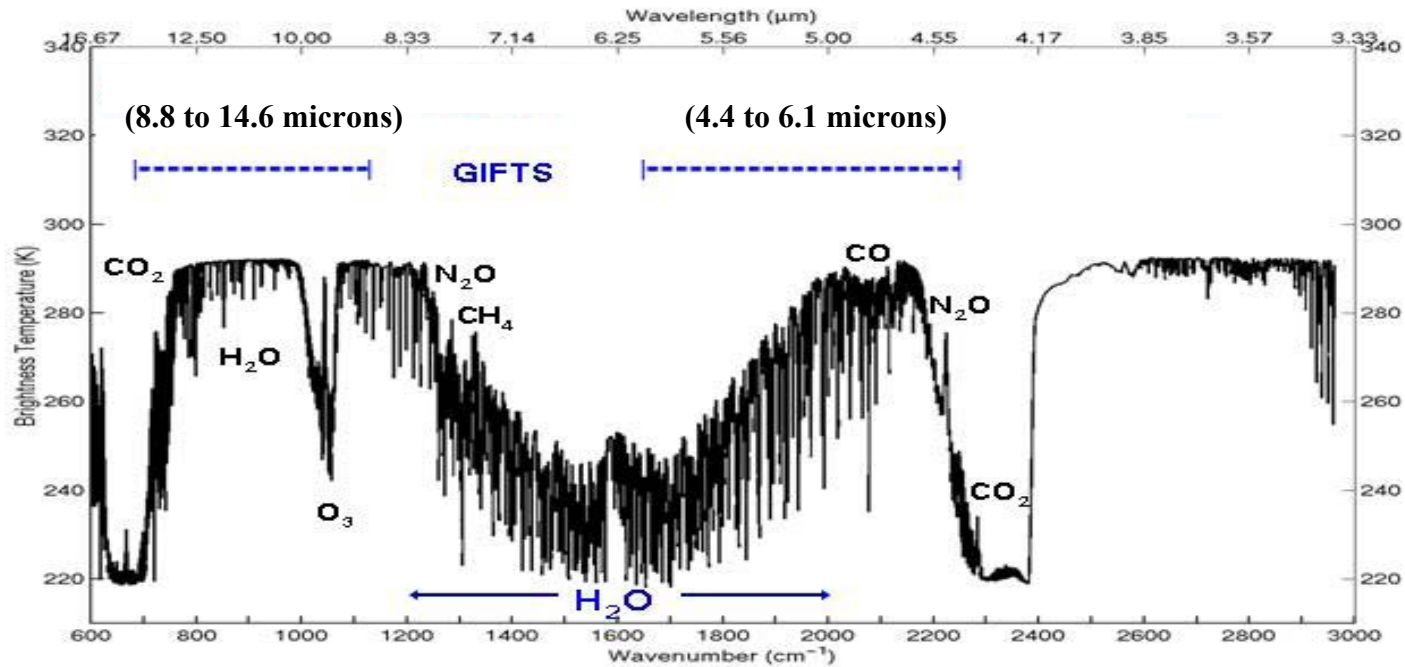
Navy - Provides Advanced Imaging/Sounding Data Products for Fleet Operations

GIFTS Sampling Characteristics



- Two 128x 128 Infrared focal plane detector arrays with 4 km footprint size
- A 512 x 512 Visible focal plane detector array with 1 km footprint size
- Field of Regard 512 km x 512 km at satellite sub-point
- Ten second full spectral resolution integration time per Field of Regard
- ~ 80,000 Atmospheric

GIFTS IR Measurements and Products



Products:

Water vapor (soundings, fluxes, winds)

Temperature (sounding, stability)

Carbon monoxide concentration (2 Layers)

Ozone concentration (4 Layers)

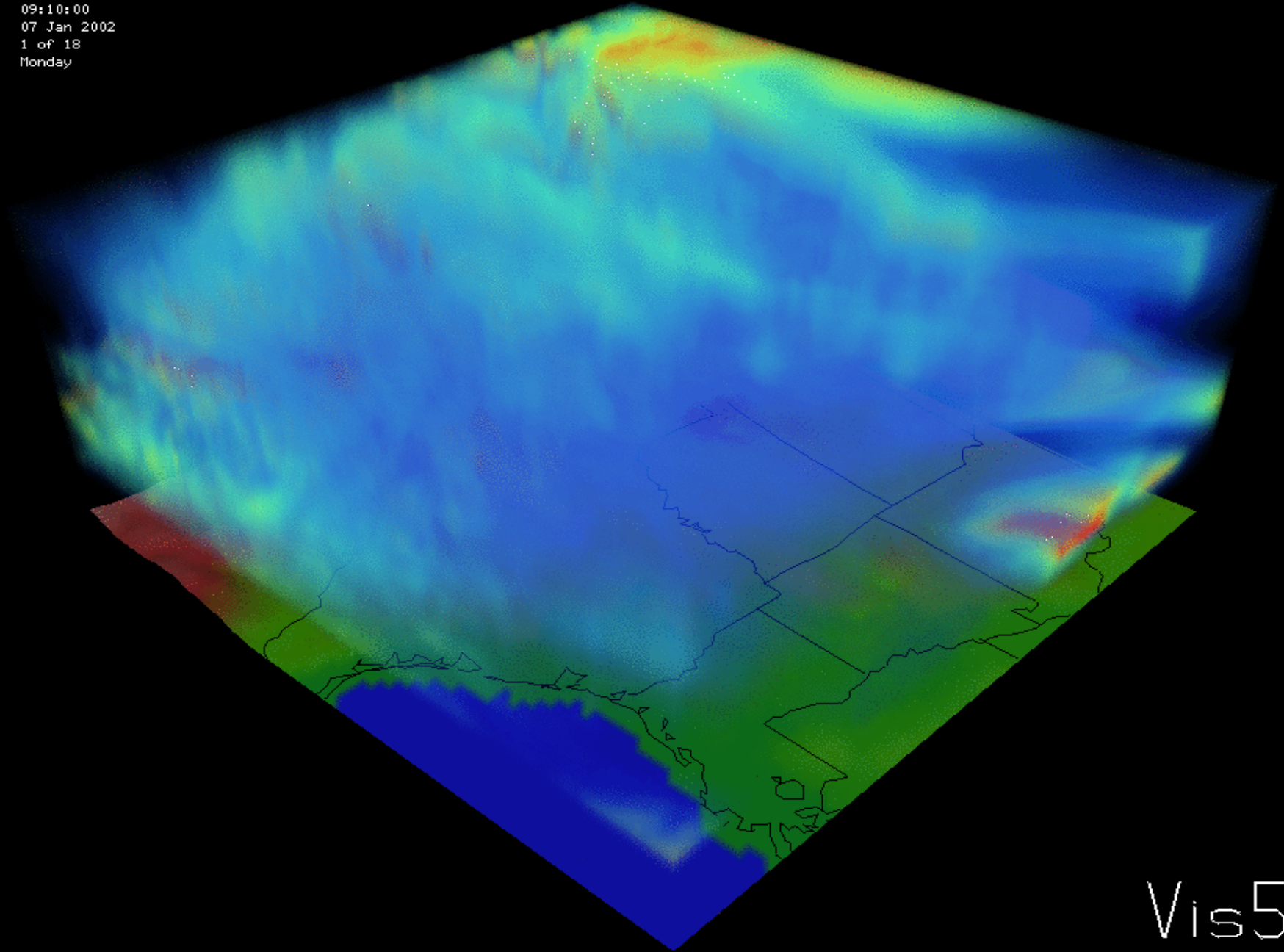
Surface Temperature and emissivity

Clouds (altitude, optical depth, microphysical properties, winds)

Mineral Dust / Aerosol Concentration and Depth

Water Vapor Flux (3 x 3 GIFTS Cubes)

09:10:00
07 Jan 2002
1 of 18
Monday



Vis5D

Wind Measurement

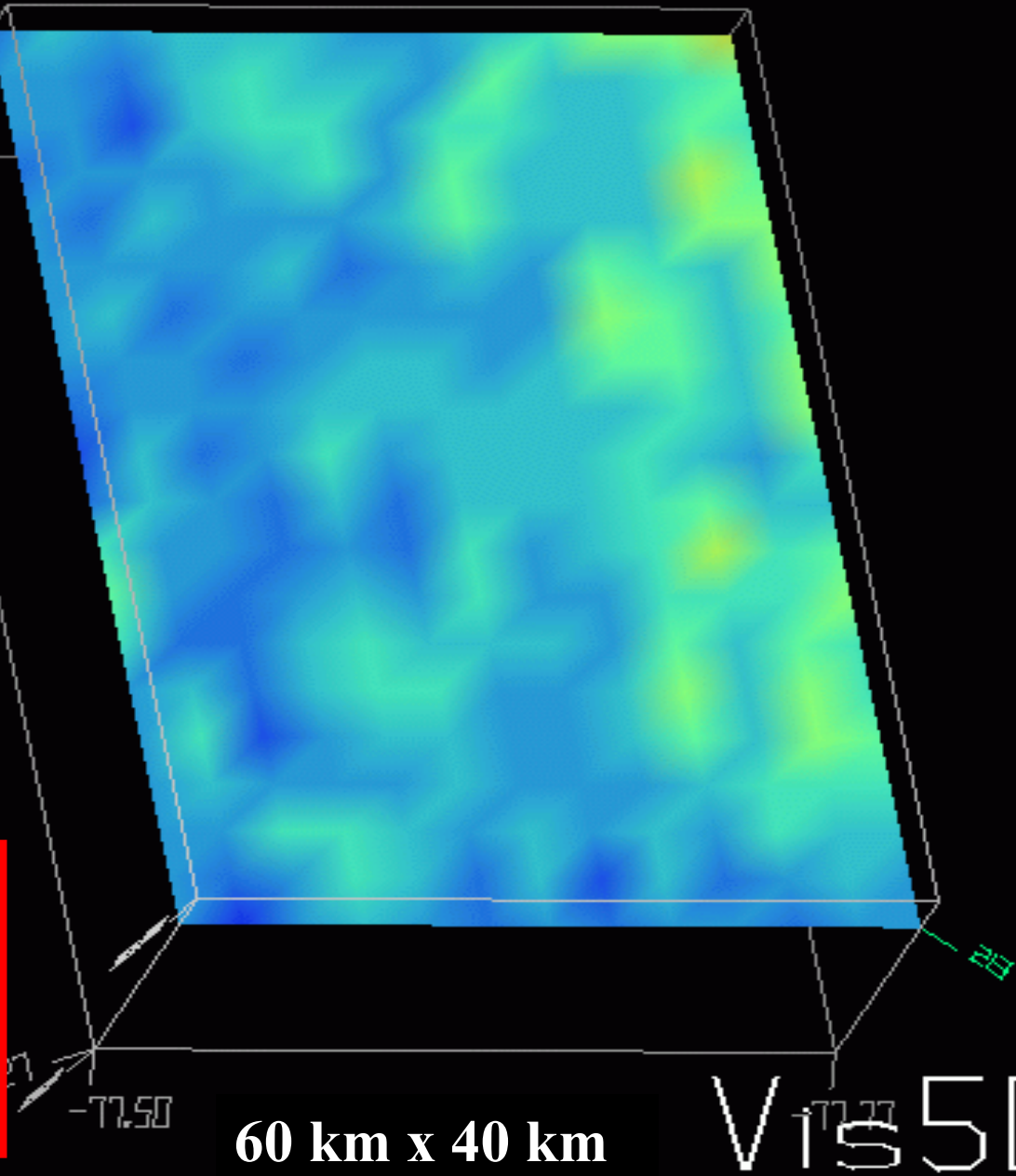
00:26:00
14 Sep 98
1 of 3
Monday

NAST-I water vapor retrieval
200 hPa Relative Humidity (%)

$\delta t \sim 35$ min



24.69



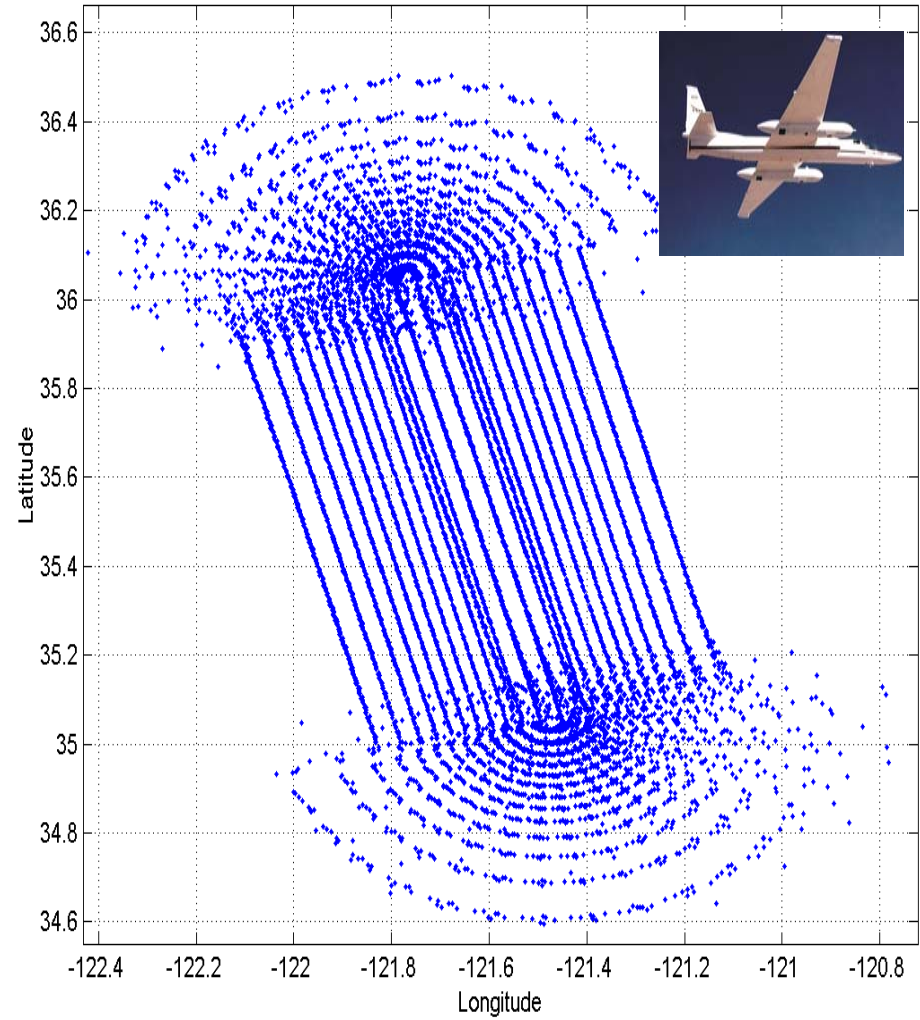
NAST-I Water Vapor Tracking Demonstrates GIFTS Wind Profiling Technique

60 km x 40 km

Vis 50

NAST Under flight by Twin Otter Doppler Wind LIDAR* Is Used to Validate Water Vapor Tracer Wind Profiles

ER-2 Flight of 11 Feb 2003

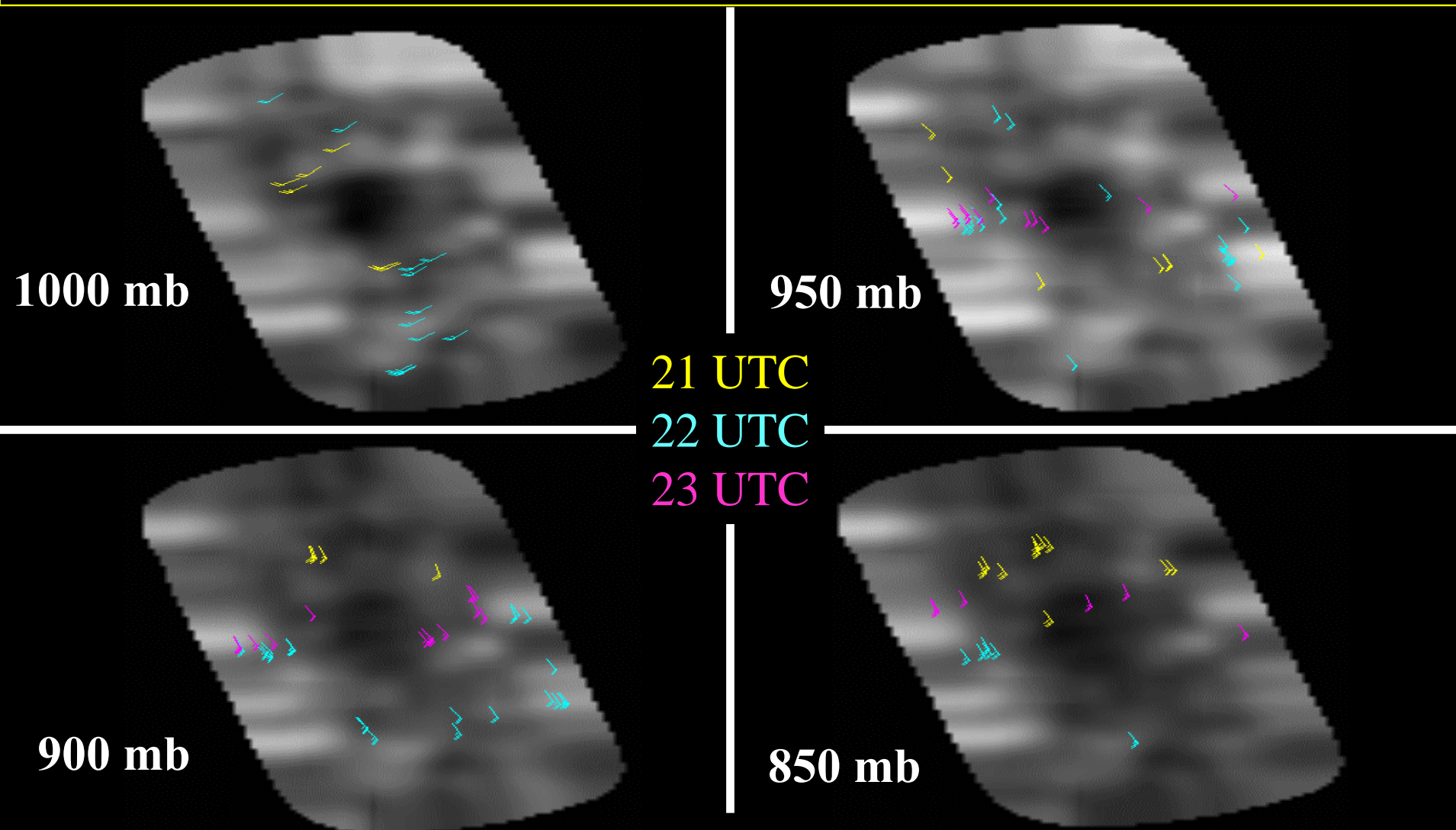


TODWL & NAST Observation Tracks

* Courtesy of G. D. Emmett, Simpson Weather Associates

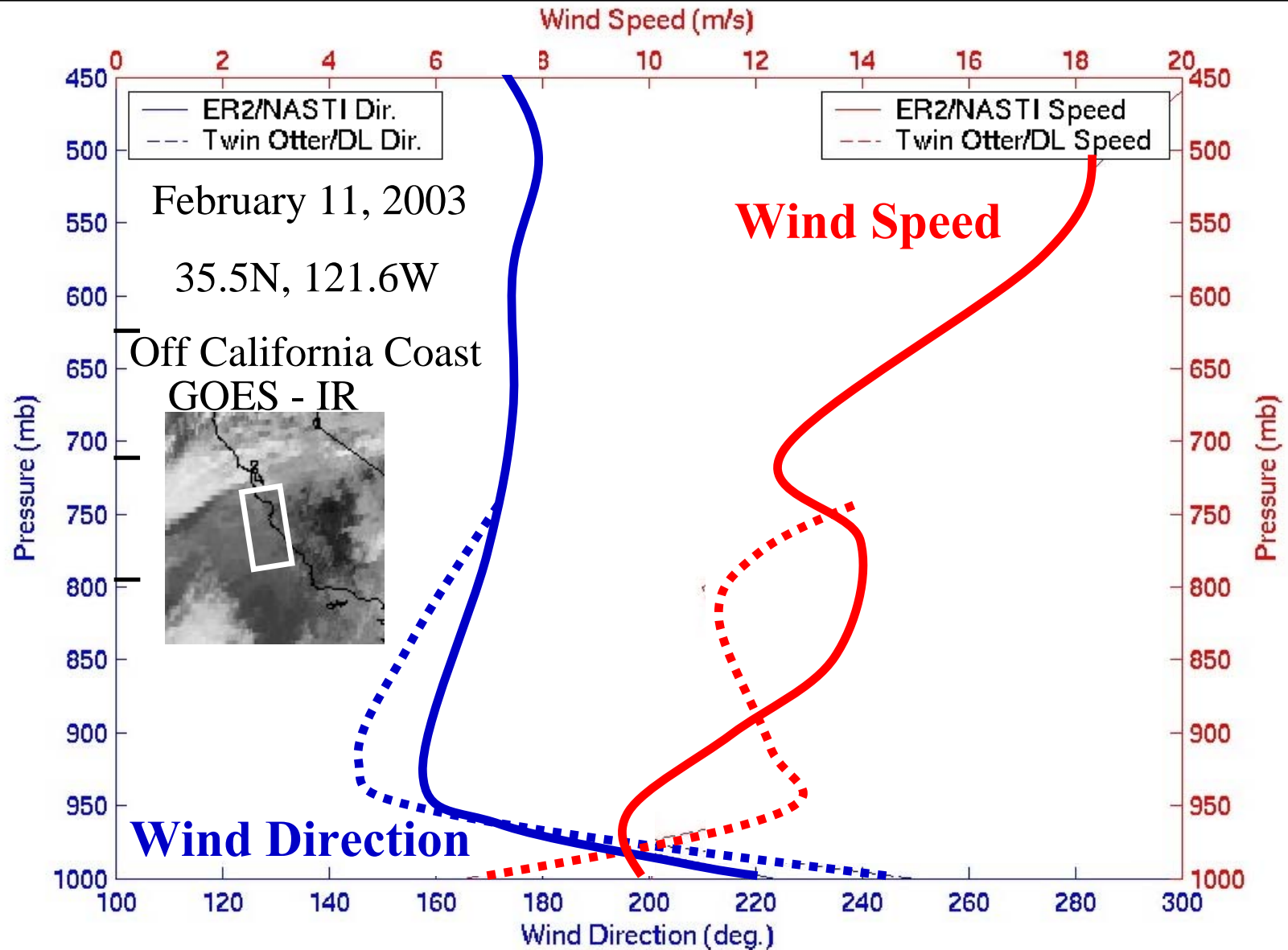
Automated NAST Water Vapor Profile Tracer*

Winds Possess Excellent Time and Space Continuity



* Tracer winds produced by University of Wisconsin WINDCO program

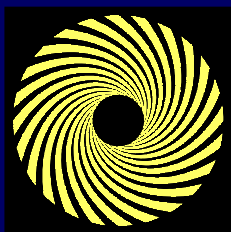
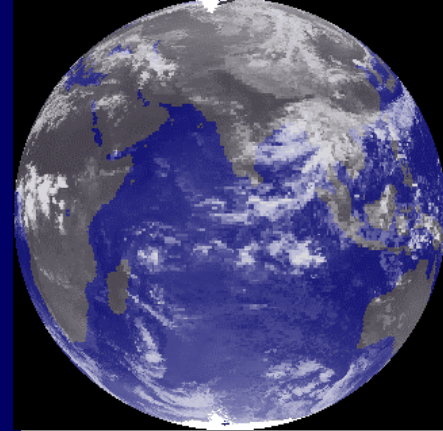
NAST H₂O Profile Winds Compare Favorably With Twin Otter Doppler LIDAR Winds ($\delta < 3$ m/s)



GIFTS

- Anticipated Australian Contribution

- provide groundstation**
- data reception**
- data processing**
- product generation**
- product distribution to weather services and global NWP centres**
- archive**



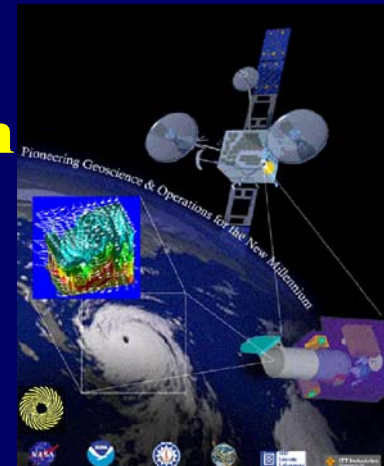
Groundstation

- . **Ground Station in WA**
- . **microwave link to receiving station**
- . **Processing, archive and distribution**

Processing

- . **PC cluster approach**
- . **Consistency with SSEC/US processing i.e. similar systems**
- . **Transition from Pacific/Atlantic to Indian Ocean seamless (products and archive)**

Archive and Dissemination



GIFTS

Day 1 Products

- Radiance Products
 - * Selected channels
 - * Superchannels
 - * Eigenvectors
 - * Pre Launch Data
- Winds - conventional tracking / clear air 4D Var.
- Temperature and Moisture Soundings
- Sea Surface Temperature and Emissivity
- Land Surface Temperature and Emissivity
- O₃ amount and profile

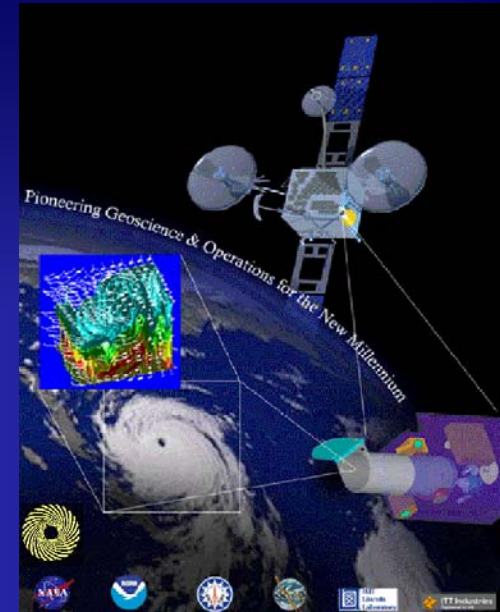


Image Processing

- Combining 10 second cubes to provide continuous fields
- Tracking of cloud features
- Multi-channel height assignment
- Tracking of moisture features on pressure surfaces

4-D Var.

- 10 second cubes used to provide $T(p)$, $r(p)$
- 4-D Var. used to solve for \underline{v} .
- later 4-D Var. used with Radiance product to solve for \underline{v} .

Status of EO-3 Mission

- All of the new GIFTS Technologies are developed, being tested, and meeting or exceeding requirements.
- Instrument is expected to be completed, tested, and launch ready by the end of 2005
- Currently identifying a spacecraft opportunity for a 2006-2009 launch, possibly through the US Air Force space test program
- Australian Bureau of Meteorology to support GIFTS data acquisition, processing, distribution, and archival for an eastern hemisphere satellite position

International TOVS Study Conference, 13th, TOVS-13, Sainte Adele, Quebec, Canada, 29
October-4 November 2003. Madison, WI, University of Wisconsin-Madison, Space Science and
Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2003.