SUMMARY OF FUTURE PLANS FOR THE RUSSIAN WEATHER SATELLITE PROGRAM

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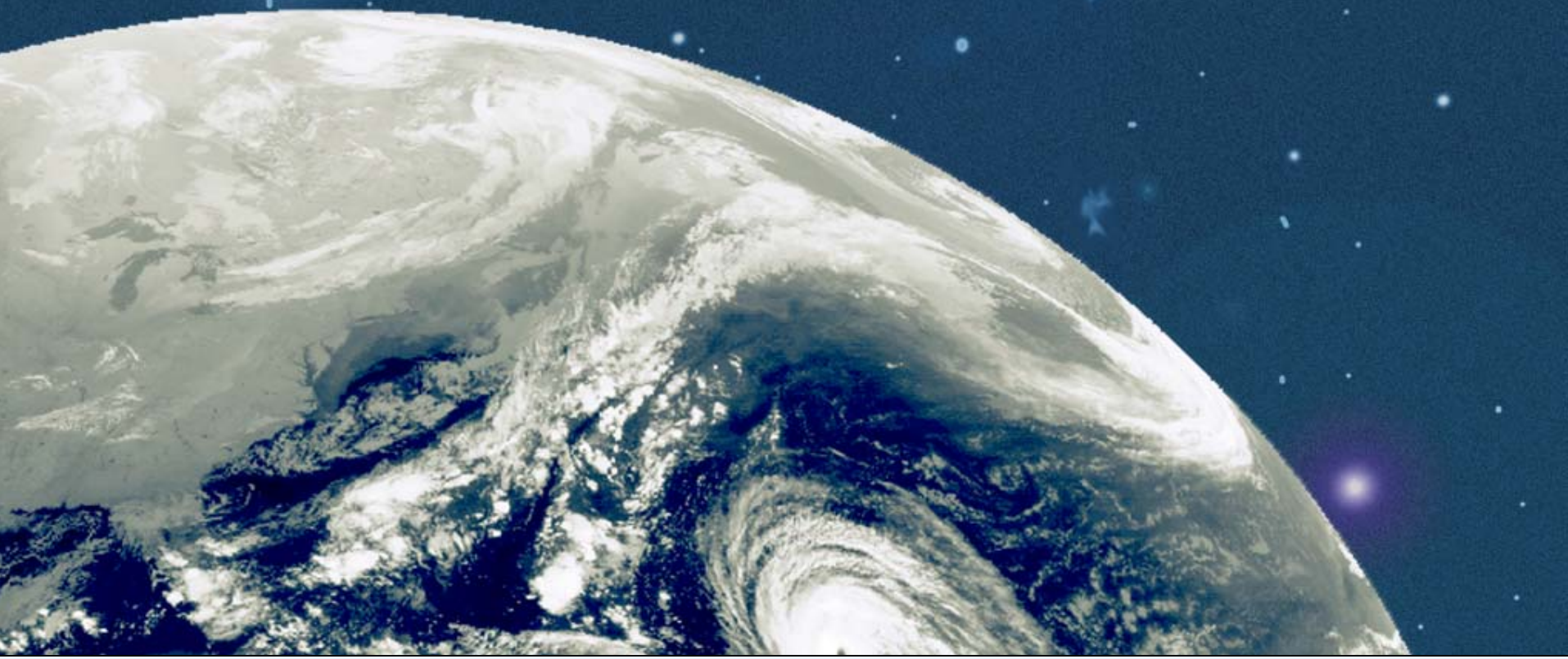


ABSTRACT

The presentation gives an overview of Russian current and future weather satellite systems. In the framework of national weather satellite systems modernization the efforts are focused on the development and manufacturing the next generation of polar-orbiting (Meteor-M series) and geostationary (ELECTRO series) meteorological satellites. These satellites are expected to be launched not later than 2006, 2007 year respectively. Some examples of satellite derived products are demonstrated.

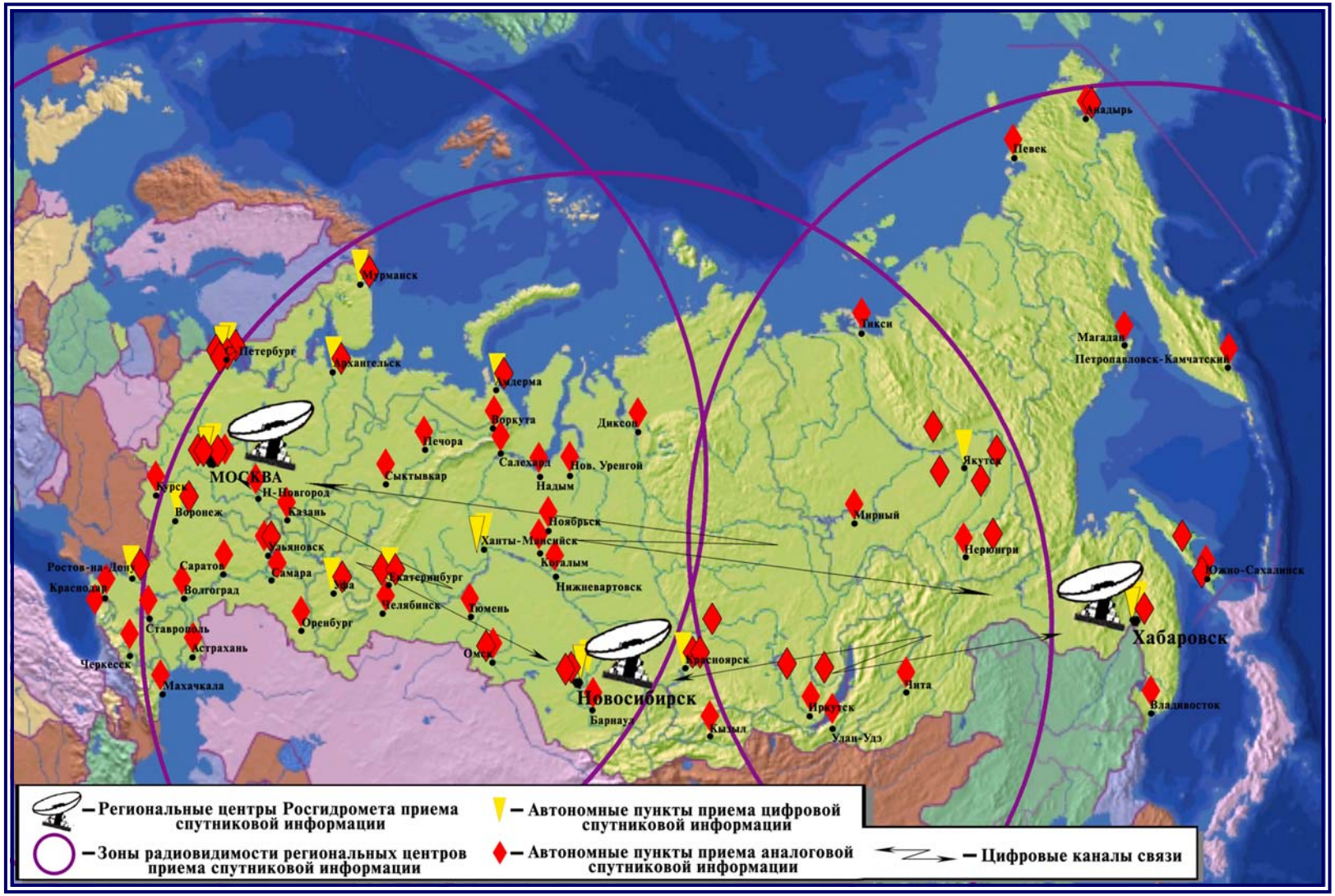
OUTLINE

1. Future geostationary meteorological satellite GOMS/Electro N2

2. Current status and development perspectives for polar orbiting satellites of METEOR series

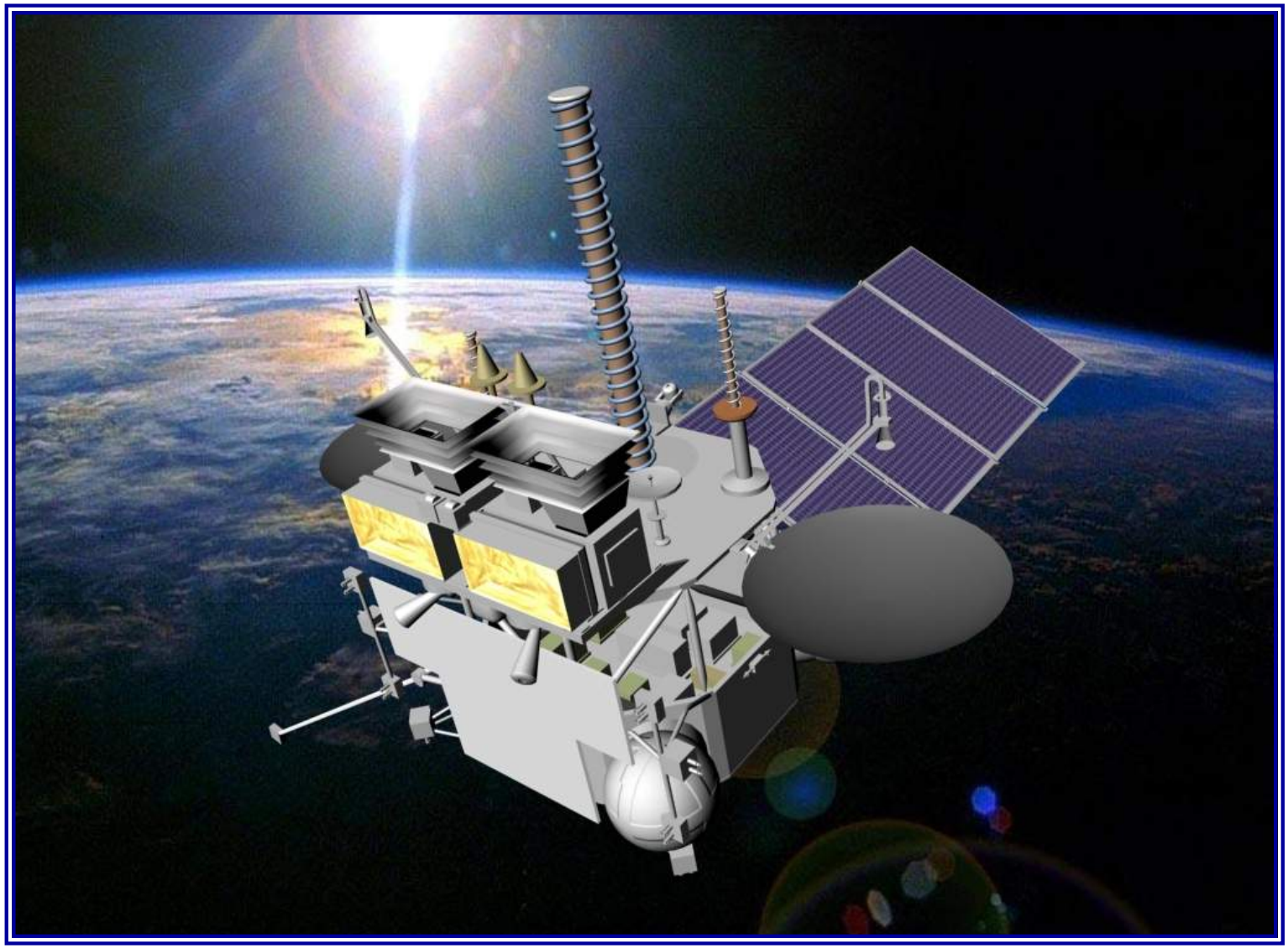
3. Satellite products and applications:
   - cloud imagery and cloud analysis
   - atmospheric temperature/moisture soundings
   - snow cover and ice concentration maps
   - forest fires detection
   - sea ice mapping

Roshydromet Ground Segment



Космическая подсистема наблюдения Росгидромета

ELECTRO-L General Design (2007)



ELECTRO-L Satellite Characteristics

- Three-axis high-precision stabilization
- In-orbit mass - 1500 kg
- Payload mass - 370 kg
- Lifetime - 10 years
- Power (end of life) - 1700W

Basic Performance Characteristics of MSU-GS

1.	Number of Channels • VIS • IR	10 3 7
2.	Spectral Range at half maximum of spectral response function (μm)	0.5-0.65; 0.65-0.80;0.8-0.9; 3.5-4.0; 5.7-7.0; 7.5-8.5;8.2-9.2; 9.2-10.2; 10.2-11.2; 11.2-12.5
3.	Image Frame (deg x deg)	20 ± 0.5 x 20 ± 0.5
4.	HRIT Ground Resolution in Subsatellite Point (km)	1.0 (VIS); 4.0 (IR)
5.	S/N Ratio for VIS channels	≥ 200
6.	NEΔT at 300K (K) • in the band 3.5-4.0 μm • in the band 5.7-7.0 μm • in the band 7.5-12.5 μm	 0.8 0.4 0.1-0.2
7.	Power (W)	≤ 150
8.	Weight (kg)	≤ 88
9.	Lifetime of basic and reserve units (years)	10

Basic Instruments Payload of the METEOR-M (2006)

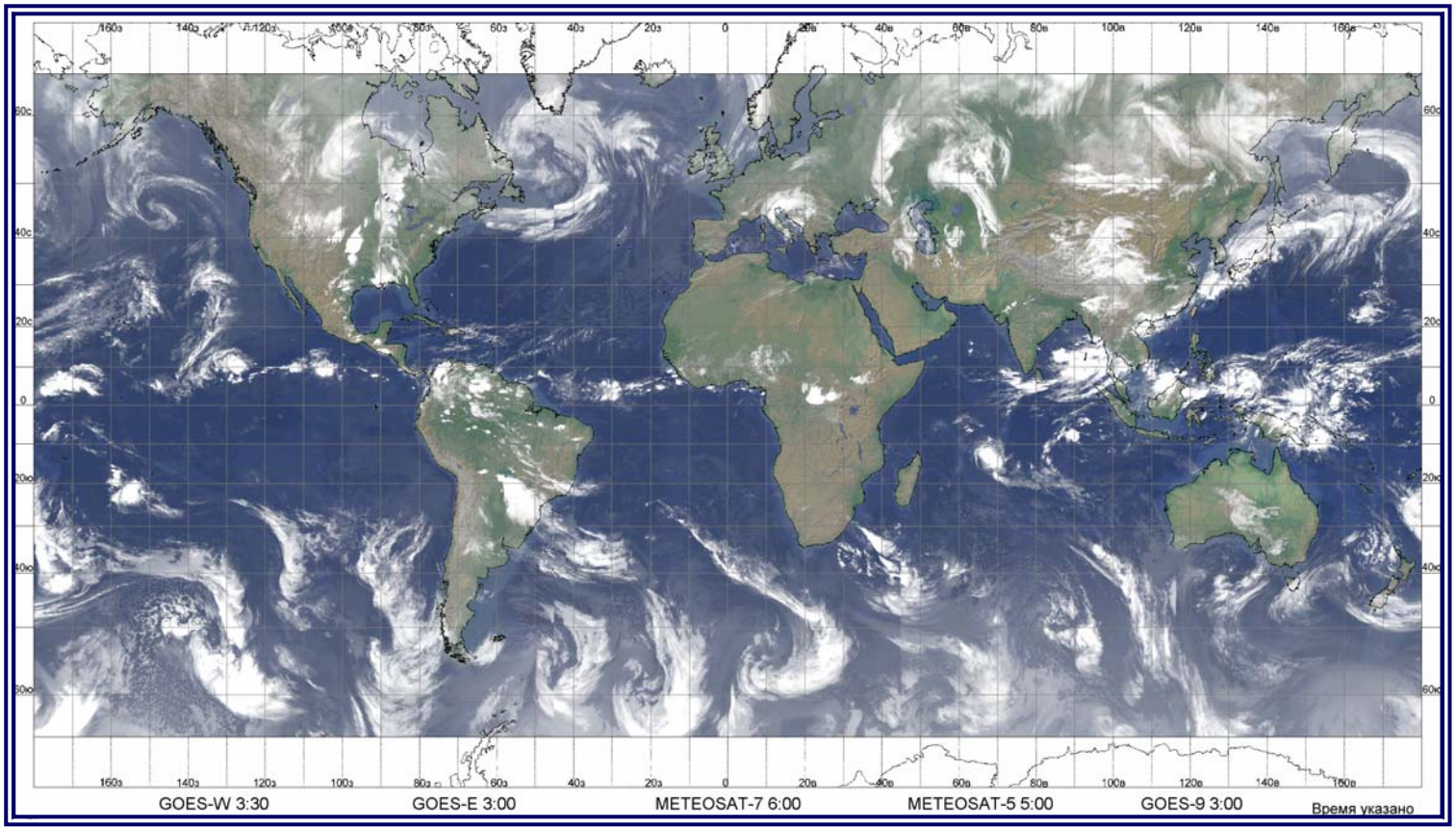
Instrument	Application	Spectral Band	Swath-width (km)	Resolution (km)
MSU-MR	Global and regional cloud cover mapping, SST, LST, …	0.5 – 12.5 μm (6 channels)	3000	1 x 1
KMSS multichannel scanning unit	Earth surface monitoring	0.4-0.9 μm	100	0,1
MTVZA imager/ sounder	Atmospheric temperature and humidity profiles, sea surface wind	10.6-183.3 GHz (26 channels)	2600	12 – 75
IRFS-2 advanced IR sounder*	Atmospheric temperature and humidity profiles	5-15 μm	2000	35
Severjanin (active radar)	Ice monitoring	9500-9700 MHz	450	0.4 x 0.5
Radiomet (radio occulation unit)*	Atmospheric temperature and pressure profiles.			

*** - be launched on Meteor-M №2 (2008)**

Advanced Microwave Instruments

	MTVZA	MTVZA-OK	MTVZA-GY	MTVZA-GY1
Orbit /km	1017	650	830	675
Scan geometry	Conical	Conical	Conical	Conical
Agency / Producer	Russian ASA/ SOC	Russian ASA/ SOC	Russian ASA/ SOC	Russian ASA &DoD/ SOC
Channel frequencies / GHz	22.2 (V-pol), 18.7, 33, 37, 42, 48, 91 (all V&H pol) 52-57 (5 chs), 183 (3 chs)	6.9, 10.6, 18.7, 23.8, 31, 37, 42, 48, 91 (all V&H pol) 52-58 (10 chs), 183 (3 chs)	10.6, 18.7, 23.8, 31, 37, 42, 48, 91 (all V&H pol) 52-58 (10 chs), 183 (3 chs)	10.6, 18.7, 23.8, 31, 37, 42, 48, 91 (all V&H pol) (10.6, 18.7, 37 - polarimetric) 52-58 (10 chs), 183 (3 chs)
Antenna Diameter / m	0.65	0.55	0.6	1.1
Primary Aim	T(z), q(z) Precipitation, CLW, TPW. SSWS	T(z), q(z) Precipitation, CLW, TPW. SSWS, SST	T(z), q(z) Precipitation, CLW, TPW. SSWS, SST	T(z), q(z) Precipitation, CLW, TPW. SSWS, SST, SSWD
FOV sample^{-1} : Lowest freq. Highest freq.	75×75 km 16×16 km	112×112km 19×19 km	96×96 km 14×14 km	46×46 km 12×12 km
Sampling density per 50km square At highest and lowest frequencies	L: 0.4 H: 9.8	L: 0.2 H: 7	L: 0.3 H: 12.8	L: 1.2 H: 17.4
Power	107W	90W	90W	120W
Mass	110kg	95kg	98kg	115g
Platform	Meteor-3M	Sich-1M	Meteor-M	Kanopus
Launch Date	Dec. 2001	Jun. 2004	2006→	2006→
Science Data rate	5.5 kbps	25 kbps	30 kbps	42 kbps

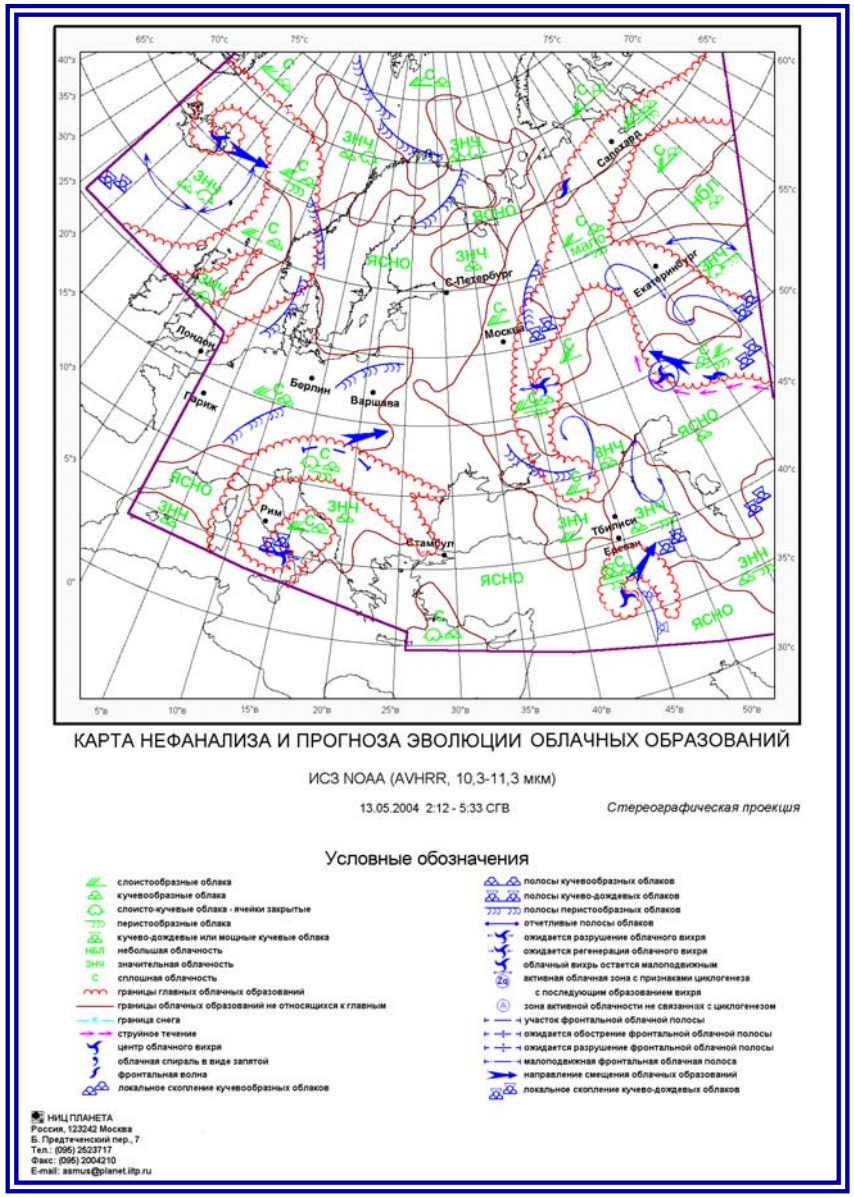
Global mosaics of IR images



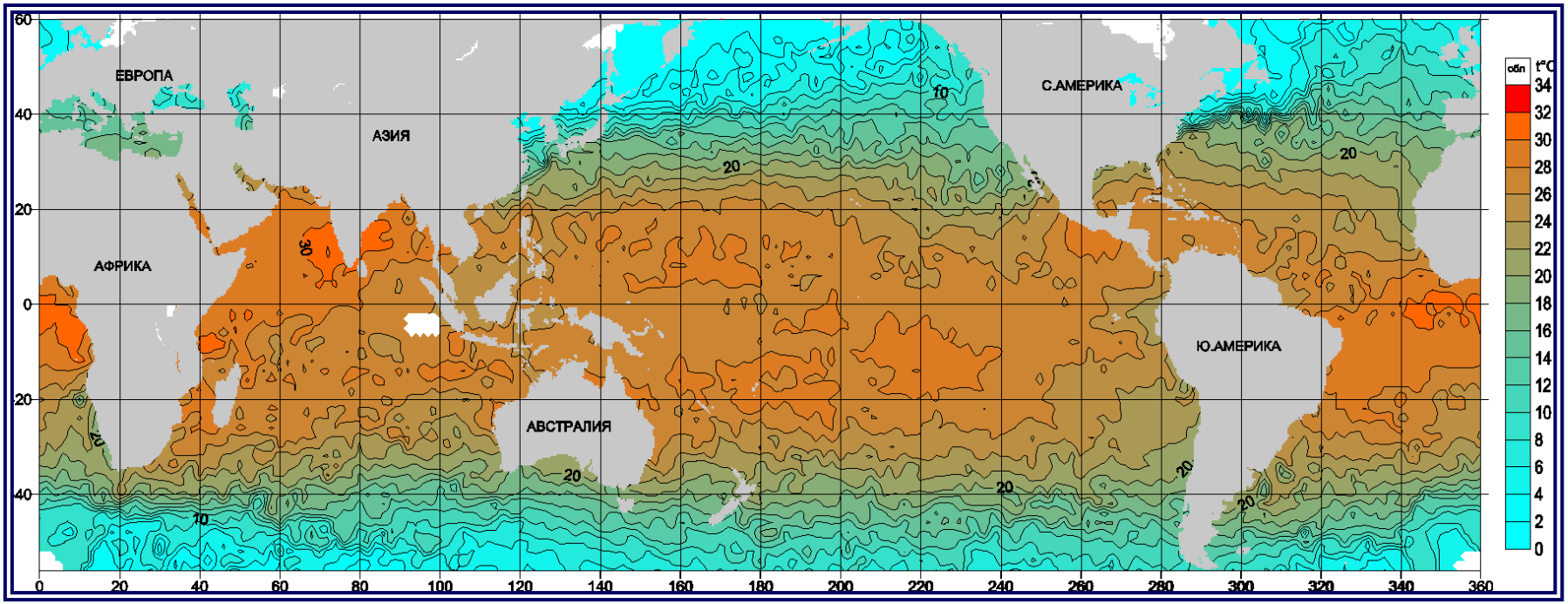
Глобальная карта облачности

ИК-диапазон 10.5-12,5 мкм 13.05.2005 г.

Clouds nephanalysis map

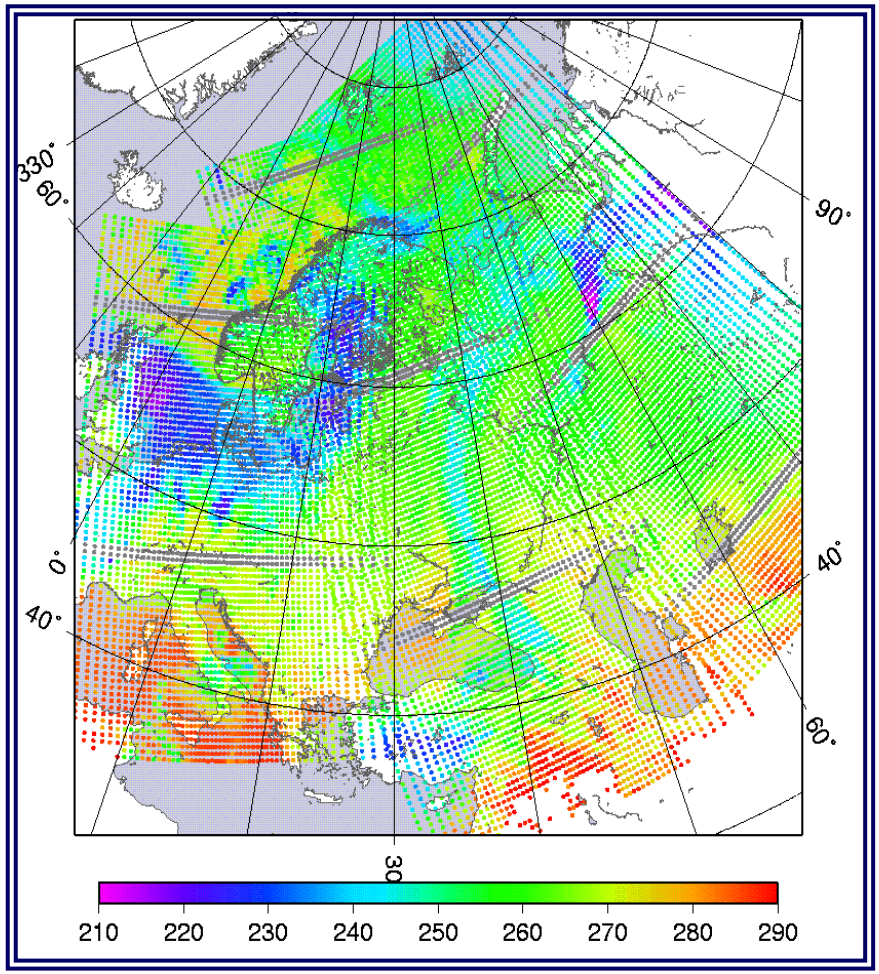


Composite Map of SST



Композиционная карта температуры Мирового океана
01.05 – 10.05 2005 г.

Area of atmosphere temperature/humidity soundings (NOAA-16, Moscow region)

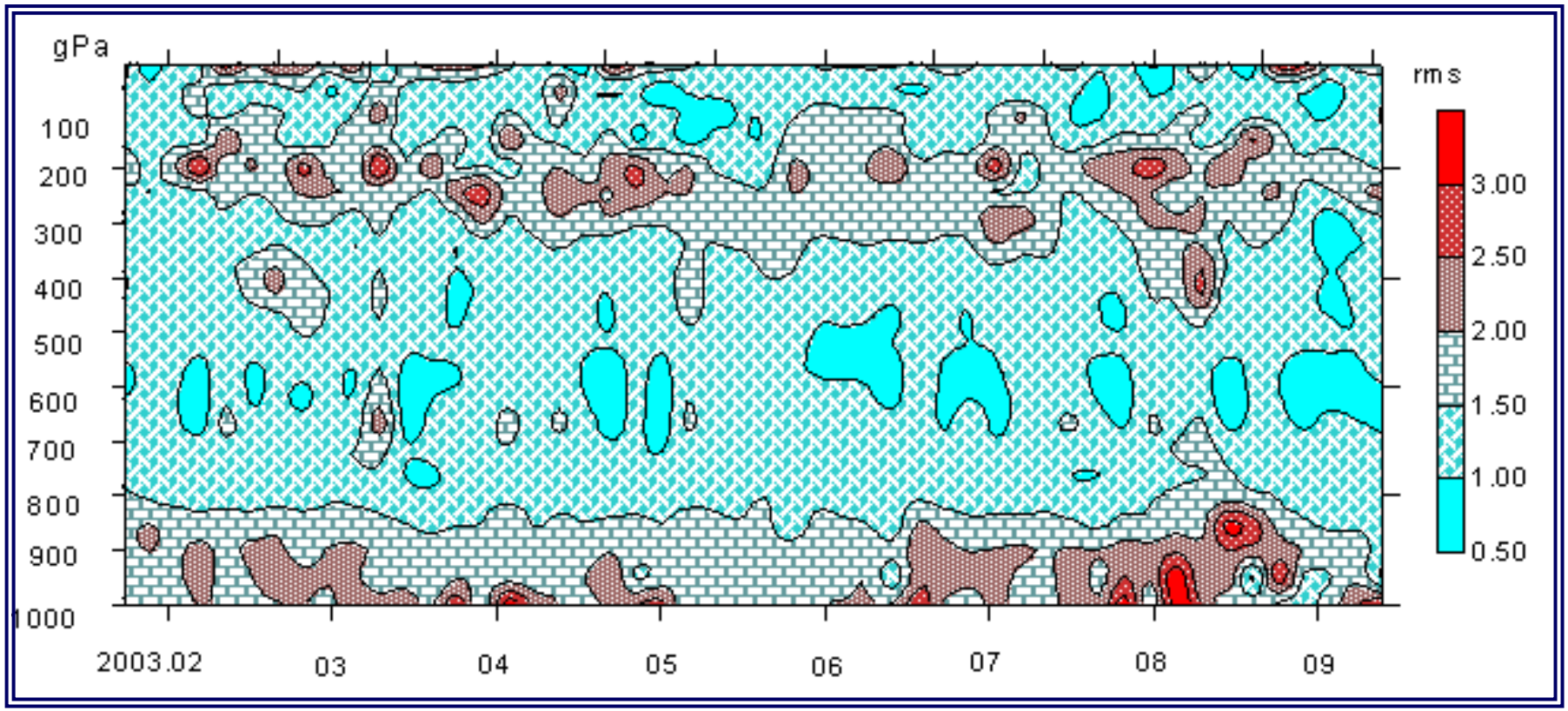


ИСЗ NOAA-16/HIRS 11.1 мкм 31.01.2005 09:14

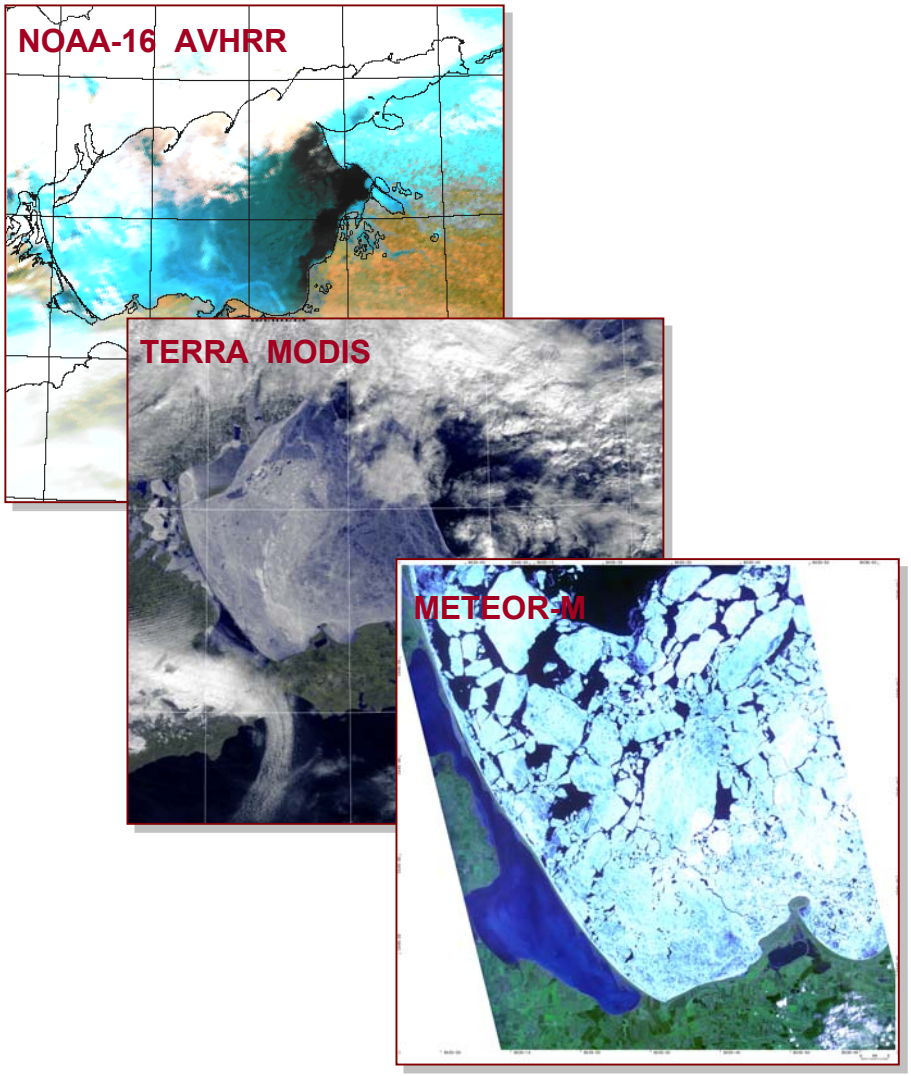
Карта покрытия данными ТВЗА

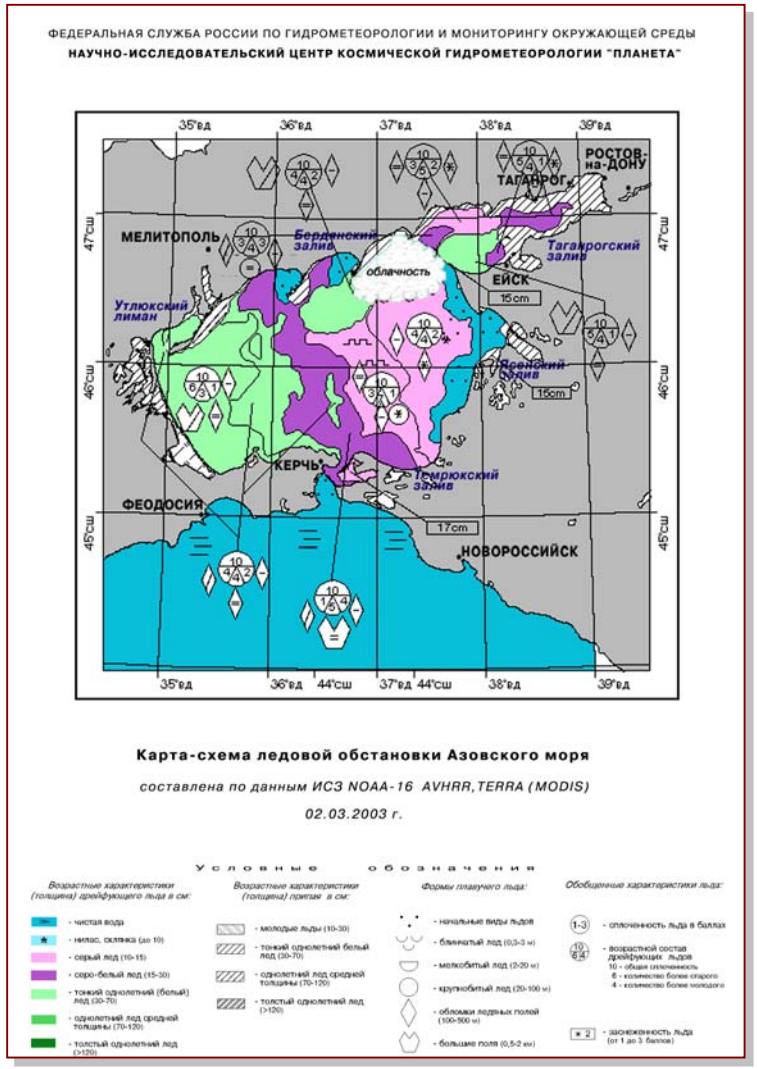
Error statistics (in terms of RMSE) for NOAA-16 based temperature soundings

(validation against radiosonde data, February – October 2003)



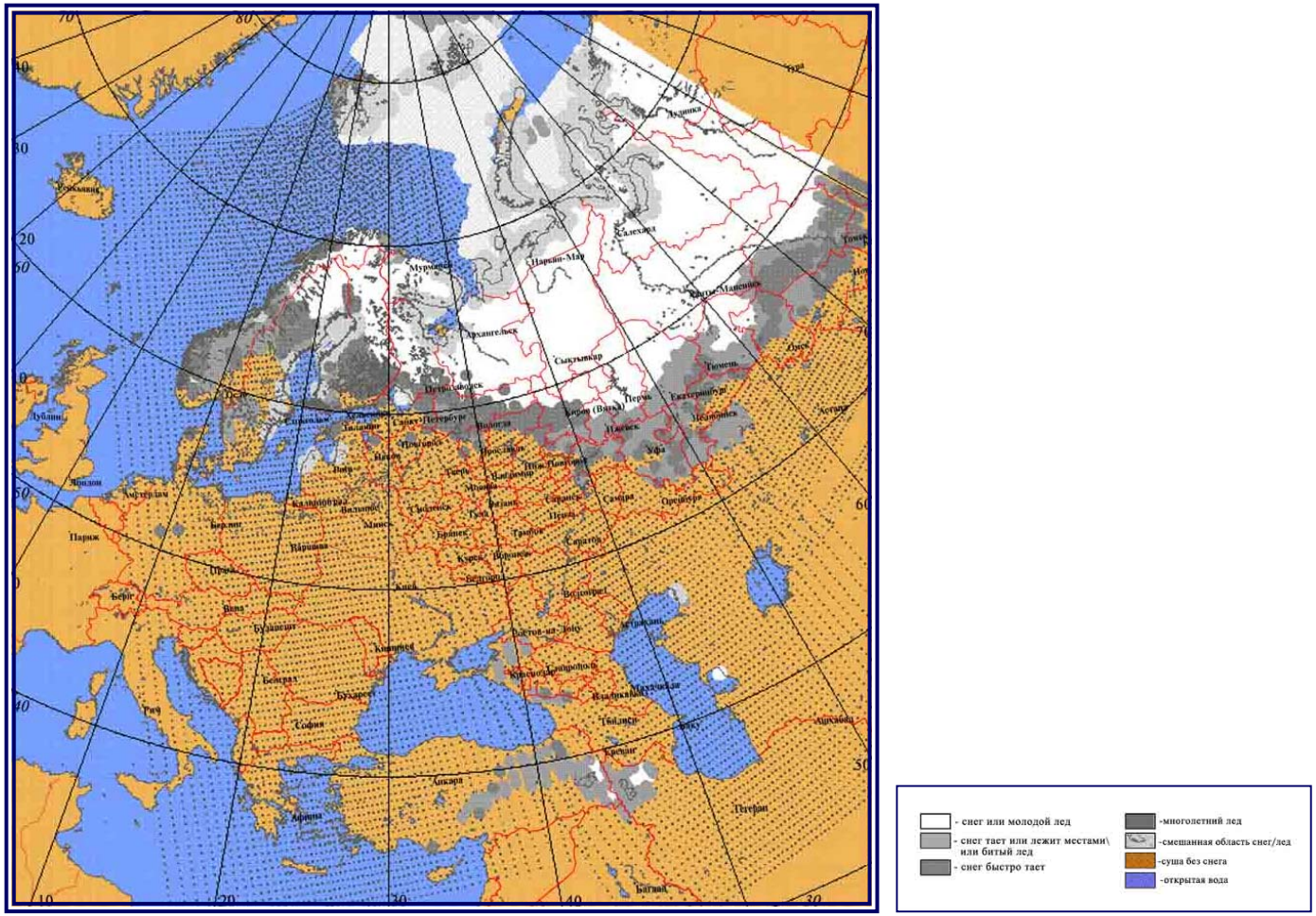
Ice Cover Map (Azov Sea)





Картирование ледовой обстановки в Азовском море

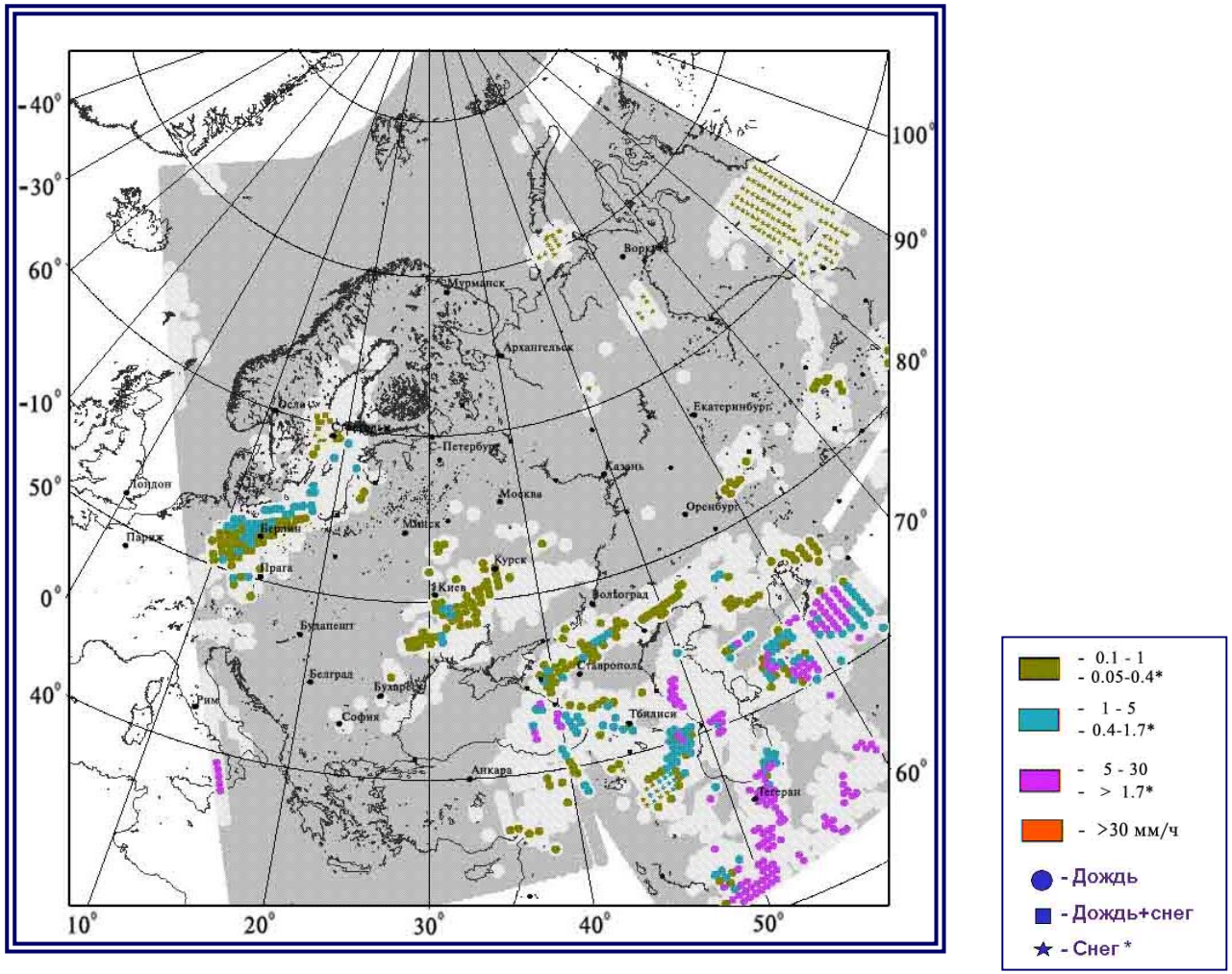
AMSU-based Snow and Ice Cover Map



23.04.2005 08:37 … 11:57 UTC

Снежный и ледовый покров. AMSU NOAA-16

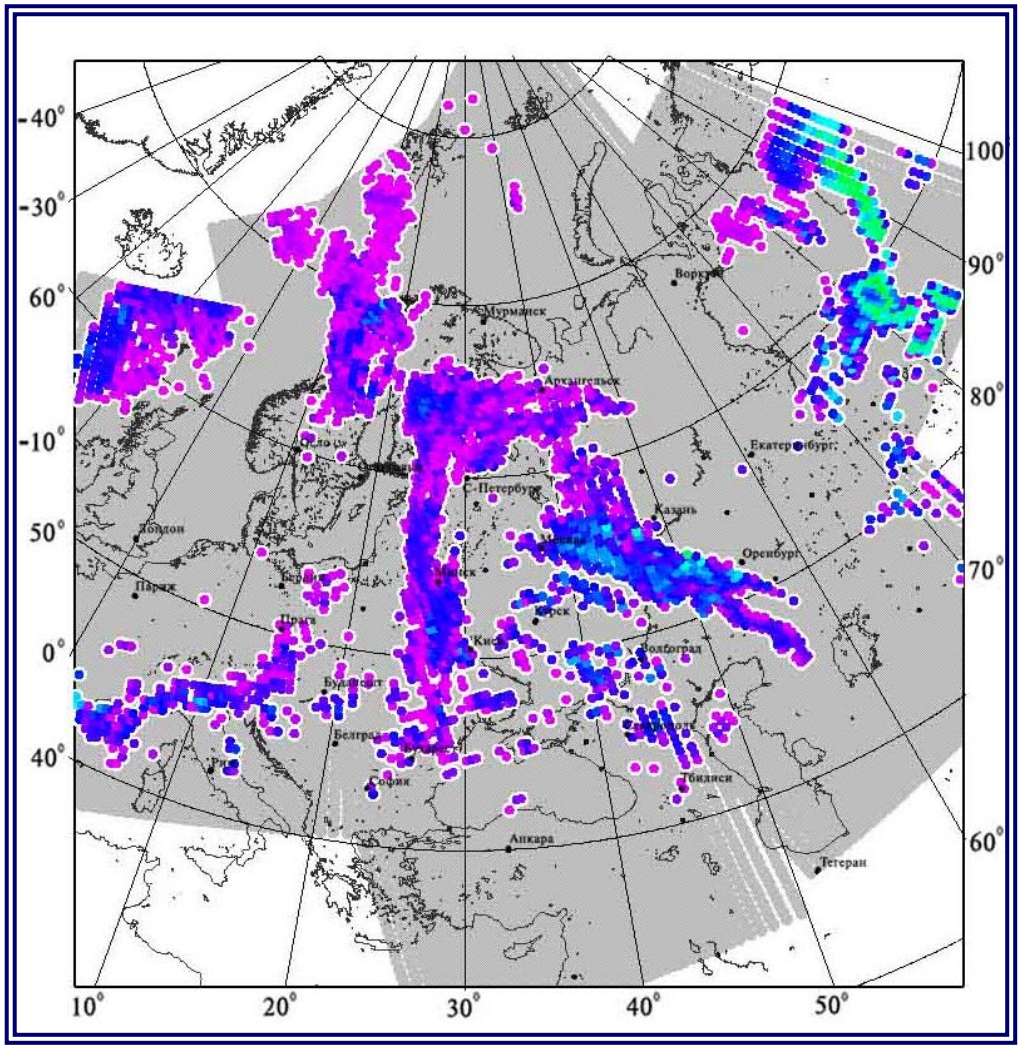
Precipitation Map
(Mean intensity, phase-rain, snow, mixed rain/snow)



AMSU+AVHRR NOAA-16 23.04.2005 08:37… 11:57 UTC

Средняя интенсивность и тип осадков

Cloud Liquid Water Estimation (mm)



AMSU+AVHRR NOAA-16 09.07.2003 07:52 … 12:54 UTC

Водозапас облаков, мм

International TOVS Study Conference, 14th, ITSC-14, Beijing, China, 25-31 May 2005. Madison, WI, University of Wisconsin-Madison, Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2005.