

SATELLITE PRODUCTS AND APPLICATION: ROSHYDROMET ACTIVITIES

Summary and purpose of the WP

This document represents an overview of Roshydromet/SRC PLANETA activities in the area of satellite data routine processing and derivation of operational products. The satellite's informational products are used by Roshydromet in various application areas, including operational meteorology, NWP, hydrology, agrometeorology, hazards (fires, floods) and pollutions monitoring, climatological studies. Examples of some satellite products are demonstrated.

Action proposed: no action required.

Roshydromet core ground segment capabilities

Roshydromet's ground segment on satellite data acquisition and processing enable to obtain the satellites data for whole territory of Russia and neighboring countries (above 20% of land surface). The major components of the Roshydromet's ground segment (managed by SRC Planeta) are three Main Regional Centers: European (Moscow – Obninsk - Dolgoprudny), Western-Siberian (Novosibirsk) and Far-Eastern (Khabarovsk) Centers. The availability of operational satellite information allows to develop the monitoring systems and to fulfill the regular observations of cloud, snow and ice covers, precipitations, floods, forest fires etc. The development of national part of these remote sensing systems is supported by Federal Space Program of Russia.

In accordance with Federal Space Program (years 2005-2015) the Russia's future satellite system will include the stable operational constellation of 2 geostationary (ELECTRO series) and 3 polar-orbiting (METEOR series) meteorological satellites. Their payload composition is expected, will provide data streams enabling to observe and to monitor (in synergy with ground-based conventional observations) severe weather events and natural disasters as well as to issue timely warning and prediction. Also, enhanced capabilities should appear to supplement data series, relating to climate parameters.

Current SRC Planeta receiving facilities provide on a regular basis the data acquisition from geostationary (METEOSAT-8, METEOSAT-7 and METEOSAT-5, GOES-E, GOES-W, MTSAT-1R via EUMETCAST system) and polar-orbiting (NOAA series, EOS/Terra/Aqua) satellites. The EUMETCAST receiving station has been successfully implemented at SRC Planeta in 2005 with support of EUMETSAT. On the base of raw data analysis and processing SRC Planeta produces every day above 80 types of products (namely maps of cloud cover, SST, vegetation, ice and snow coverage, atmospheric temperature/humidity sounding, as well as products related to floods and forest fires monitoring, detection of water and snow cover pollution, etc.). Satellite-based informational products are regularly disseminated via Internet for more than 200 "federal" and "regional" users. Along with this some above mentioned informational products are available via specially dedicated WEB-sites designed and supported by SRC Planeta (<http://planet.iitp.ru> , <http://planet.rssi.ru>).

The development of future METEOR-M N1 and Electro-L N1 (are planned for launches in 2007) ground segments is being continued (receiving stations, hardware, software and communication links).

Below the progress in SRC Planeta satellite products generation is briefly outlined.

Cloud imagery and cloud analysis

Cloud imageries and cloud cover parameters continue to be one of key output products derived from polar orbiting and geostationary meteorological satellites data. Mosaics of infrared images over Eurasia are derived from Meteosat 8, Meteosat 7, Meteosat 5 and MTSAT-1R data. Similar global mosaics are generated daily on the basis of various compositions of imageries provided by 5 geostationary satellites. On the other hand, some “quantitative” cloud products are derived daily, including estimates of cloud cover fraction, cloud top temperature and height (CTTH). Now the validation of CTTH is being continued. Clouds nephanalysis maps are produced every day on the base of AVHRR NOAA data and are disseminated via GTS.

Tropical cyclones monitoring

The detecting and monitoring of tropical cyclones is performed on the base of data provided by 5 geostationary satellites. Global and regional maps of cyclone trajectories are produced regularly. Data on tropical cyclones center coordinates are disseminated via GTS.

Sea surface temperature maps

World Ocean surface temperature maps are derived regularly (one per ten days period) from the data provided by 5 geostationary satellites. The accuracy of SST retrievals from geostationary satellites IR data is about 1.5 – 2.0K. Sea surface temperature maps for “inner” and “external” seas of Russia are generated daily from AVHRR NOAA data with accuracy better than 1K (using standard split-window technique).

Ice cover operational mapping

Currently, the ice cover maps for Arctic region and others “inner” and “external” seas of Russia are derived daily from the AVHRR (NOAA) and MODIS (Terra, Aqua) low and moderate resolution data. High resolution (38 m) images provided by MSU-E imager (Meteor 3M N1) were used for detailed analysis of ice condition on seas, rivers, lakes, and reservoirs. After the launch of satellite METEOR-M N1 (2007) it is planned to renew the radar monitoring of ice covers in Arctic and Antarctic regions.

NOAA-based regional monitoring of precipitation zones, ice and snow coverage

The experimental technology has been developed and implemented for NOAA AMSU and AVHRR data processing. It provides the detection of precipitation zones and discrimination the precipitation phase as well as snow and ice coverage mapping. In 2005 the technology has been applied to NOAA-18 data and currently the above mentioned experimental products are regularly provided to users.

Precipitation mapping based on IR data from geostationary satellites

The experimental technology has been developed for producing the precipitation maps (including estimation of phase and intensity) based on combined analysis of IR imagery and output data of special NWP model. Now the validation of above-mentioned products is underway.

Forest fires detection

The unified system for forest fires and burnings mapping has been developed and regularly operates in European (Moscow, SRC Planeta), Western-Siberian (Novosibirsk) and Far-Eastern (Khabarovsk) centers of Roshydromet.

The detection and mapping of forest fires for whole territory of Russia are carried out in automatic regime on the base of MODIS (Terra, Aqua) and AVHRR (NOAA) data using standard hot spot technique. Along with this, moderate (250 m) resolution imagery data , provided by MODIS (Terra, Aqua), are exploited for more detailed interactive visual analysis of forest fires, smokes and burnings dynamics. Daily produced fires products are transmitted regularly to Russian forest fires service.

Monitoring of sea water pollution

Monitoring studies of pollution propagation within Azov and Black sea coastal zones continues on a regular basis. The data provided by MODIS (Terra, Aqua), NOAA, ERS-2, Envisat, QuikSCAT, TOPEX/Poseidon and Monitor-E (Russian environmental satellite) are applied for regular detection and mapping of pollution areas. In the framework of this monitoring a number of hydrodynamical circulations with the size 5 – 50 km have been detected. The mapping of these hydrodynamical structures is carried out once per ten days.

Climate related studies

On the base of archived and operational satellite data sets SRC Planeta continues to investigate ice cover changes in Russian sector of Arctic and monitoring of desertification for the Kalmykia region and Northern coastal zone of Caspian sea. Multiyear sea ice cover mapping and assessment of ice cover changes were carried out for the period 1983 - 2005 using data from satellites of Okean series and QuikSCAT data. Monitoring of desertification for above mentioned regions is being performed since 1991 on the base of Resurs, Okean and Terra data.

Examples of operational and climate related informational products are demonstrated in our Power Point presentation.