SATELLITE PRODUCTS AND APPLICATION: ROSHYDROMET ACTIVITIES

Summary and purpose of the WP

The 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

The major components of the Roshydromet's ground segment are three Main Regional satellite data receiving and processing Centers at different locations: European (Moscow, SRC Planeta), Western-Siberian (Novosibirsk) and Far-Eastern (Khabarovsk). The ground segment also includes the network of APT, HRPT and WEFAX receiving stations. Roshydromet's main satellite Center SRC Planeta (Moscow) performs a scientific and methodological management and coordinates the activities of the above-mentioned acquisition Centers and stations. These Centers cover the whole territory of Russia, neighboring countries, as well as major part of Europe.

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 via METEOSAT-7 EUMETCAST system) and polar-orbiting (Meteor-3M N 1, 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 informational products are regularly disseminated via Internet for more than 100 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://sputnik1.infospace.ru).

Current activities within Roshydromet and SRC Planeta are concentrated on providing all operational functions and services (satellite data acquisition, processing, generation and dissemination of products) as well as on the preparation to the forthcoming Russian satellites data handling.

The development of future METEOR-M N1 and Electro-L N1 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 constructed from Meteosat 8, Meteosat 7, Meteosat 5 and MTSAT 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.

Regional temperature-humidity soundings of the atmosphere from ATOVS/NOAA data

The efforts have been continued at SRC Planeta on the exploitation the ATOVS/NOAA (including NOAA-18) data processing system, intended for the retrieval of atmospheric temperature-humidity vertical profiles. Currently the processing of locally received HRPT ATOVS data is performed regularly, moreover operational sounding products of local coverage are available once per day. It enables to retrieve the temperature profiles with mean accuracy (mean RMS error) of 1.5 K within the layer 1000-70 hPa. Moreover the noticeable accuracy improvement (about 0.3-0.4 K) is achieved.

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) are used for detailed analysis of ice condition on seas, rivers, lakes, and reservoirs. After the launch of satellite METEOR-M N1 (supposedly in 2006) 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

In 2004 an experimental technology has been developed and implemented for NOAA-16 AMSU and AVHRR data processing. It provided the detection of precipitation zones and discrimination the precipitation phase as well as snow and ice coverage mapping. In September 2005 the technology has been adapted to NOAA-18 data and starting from October this year the above experimental products are regularly provided to users.

Precipitation and lightning mapping based on IR data from geostationary satellites

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

Forest fires detection

The uniform 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 AVHRR (NOAA) and MODIS (Terra, Aqua) data using standard hot spot technique. Along with this, high (38 m) and moderate (250 m) resolution imagery data , provided by MSU-E (Meteor 3M N1) and MODIS (Terra, Aqua) respectively, are used for 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 and snow cover pollution

The multispectral high-resolution data from Meteor 3M N 1 and moderate resolution imagery data provided by MODIS (Terra, Aqua) are applied for regular detection and mapping of pollution areas on snow cover around industrial centers as well as for monitoring and studies of pollution propagation within sea coastal zones. In this line the monitoring of Eastern coastal zone of Black Sea is carried out using all suitable satellite data. In the framework of this monitoring a number of hydrodynamical circulations with the size 5 – 50 km were detected. The mapping of these hydrodynamical structures is carried out once per ten days.