

MULTI-PURPOSE GROUND TERMINAL FOR HIGH RESOLUTION SPACE IMAGES RECEPTION

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Abstract. Operational high resolution space imagery supported by different remote sensing programs is required to resolve a variety of practical tasks, related to monitoring of emergency situations and transient processes. ScanEx Research & Development Center (www.scanex.ru) has found a solution by designing UniScan™ multi-purpose small-size ground station.

The UniScan™ ground receiving station in fixed and mobile versions with 2.4 m or 3.6 m diameter antenna system is capable to receive data in X-band with data rate up to 170 Mbps in one channel from 14 current Earth observing satellites; among them are IRS-P6, IRS-P5 Cartosat-1, EROS-A, and EROS-B satellites with high-resolution sensors. After EROS-B commissioning the Moscow UniScan ground station with the 2.4 m antenna has successfully acquired EROS-B data with submeter resolution in X-band at the total rate of 350 Mbps. The receiving hardware and data ingest software may be upgraded to the new satellite data rates and formats. New UniScan terminal will start to receive Resurs-DK high-resolution images in 2007.

Two EROS compatible Ground Receiving Stations located in Moscow and Irkutsk received about 800 scenes from EROS-A satellite starting from 2005, with 500 of them in 2006. High-resolution satellite images were supplied to the government organization under the Illegal Forest Cutting Monitoring Program (IFCMP) and the Transport Highway Construction Program (“Amur” Highway).

1. INTRODUCTION

ScanEx R&D Center has worked out the universal multi-program UniScan ground receiving station that serves as the basis for the development of regional remote sensing centers at local administrations, departmental networks (Ministry of Natural Resources, Emercom, Russian Federal Service for Hydrometeorology and Environmental Monitoring (RosHydroMet)), educational and commercial RS centers and GIS. In its complete outfit the station provides for the data reception from 14 satellites of world leading RS programs at the rates up to 170 Mbps in one channel.

2. MULTI-MISSION SATELLITE DATA INTEGRATION

Station operator defines a concrete set of compatible RS programs depending on the remote sensing center tasks for the multiple use of radar and optical sensors' data at different resolution and with different operability. In resolution and operability of space images different RS programs can be combined into several groups:

- EOS (Terra, Aqua, and in future – Meteor-3M and NPP) for day-to-day “big picture” monitoring with high revisit periods and low resolution (data direct readout, free access);
- IRS, SPOT and Landsat-5 for repetitive imagery using middle resolution sensors (direct data reception by license, IRS, SPOT – with the option to book emergency imagery of the required area);
- High resolution radar satellites (RADARSAT-1, ENVISAT-1, in future – TerraSAR-X, RADARSAT-2) for prescheduled and emergency all-weather radar imagery of targets and transient processes (licensed imagery by order);

Such an approach was used when outfitting three centers of RosHydroMet under the World Bank contract with UniScan ground stations that allow for receiving Terra, Aqua, RADARSAT-1, SPOT-4 and EROS-A satellites data. Similar approach was taken to build up a network of space monitoring receiving stations of Russian Emercom, regional center of space geo-information in Samara and in the commercial network of ScanEx ground receiving stations.

Dual-satellite EROS program of ImageSat International provides for a high probability and precision of images thanks to favorable orbital parameters. Satellites are put into morning and afternoon sun-synchronous orbits. A comprehensive analysis of the space imagery data allows the user to order high-resolution images in near real-time from EROS satellites to monitor the dynamics of events in remote Russian areas.

Under the 2100 km long Amur Highway Construction Program, an annual complex monitoring of the construction has been implemented. High-resolution EROS imagery enables to keep an eye on asphalt work of the 7-m wide road (Fig.1).

Under the annual Illegal Forest Cutting Monitoring Program, initiated by Russian Forestry Agency starting 2005, for the area of 1 million square km, EROS images are used for supervision of compliance with licenses and logging permits in the areas where preliminary SPOT 4 imagery was done with 10 and 20 m resolution. Merging EROS-A and SPOT-4 images enables to obtain color-synthesized images of the logging areas (Fig.2).

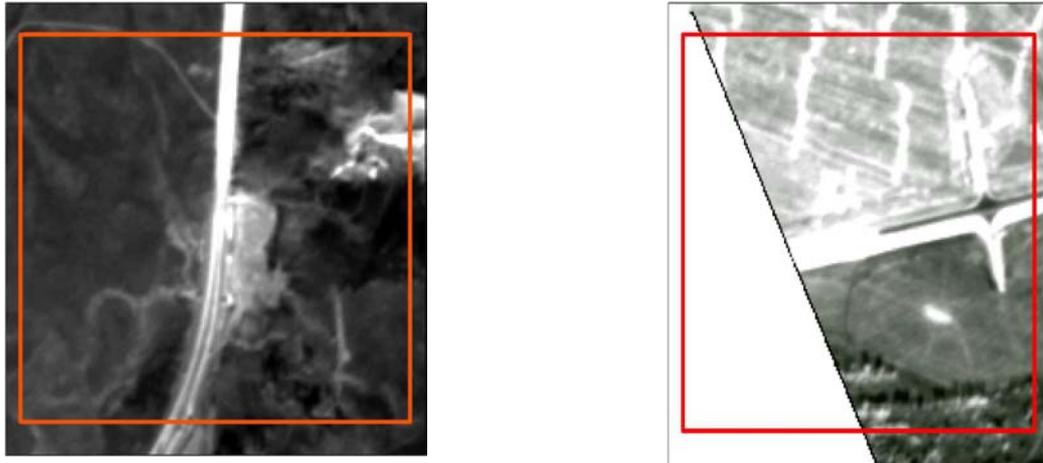


Fig. 1. Asphalt work monitoring of Amur highway construction, EROS A, 1.10.2006, resolution 2 meters ©ImageSat Int., 2006

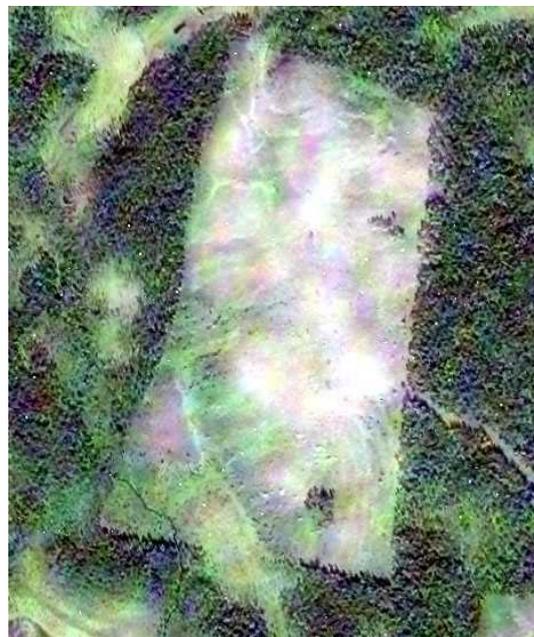


Fig. 2. Logging area in the north of Russia. Fusion of EROS and SPOT 4, 2006, resolution 2 meters.

ScanEx R&D Center works on several projects to create geo-services and geo-portals using complete ortho coverage of the regions with high-resolution IRS images. In 2007, the first part of the project was launched with the Moscow Region ortho coverage. (<http://new.kosmosnimki.ru>). IRS-P5 Cartosat-1(ANTRIX) satellite images, received by UniScan ground stations, are planned to be used for updating and extending the footprint.



Fig. 3. Gelendjik airport construction process. Black Sea, Caucasus. EROS-A and SPORT-4 color fusion, 2006, 2m resolution.

3. CONCLUSION

Remote sensing data reception centers with multi-purpose UniScan ground stations enable to extend the range of real-time satellite-based monitoring tasks. Multiple use of space images provides for the optimal and near real-time targeting at the areas of interest, for supervision of activities in remote regions, for getting additional information from the color composite images received as a result of different RS systems sensor's image fusion.