

Web-Access to Real-Time Earth Observation Data for Fire Detection and Impact Assessment

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ABSTRACT:

An integral solution for reliable and fast web-access to Earth observation satellite data in support of forest management and fire-protection services in Russia has been developed. It consists of the universal UniScan™ ground stations (www.scanex.ru), equipped with small-size antenna systems to receive a wide range of remote sensing data, local imagery data archive, electronic web-catalog and EOStation web-service for real time MODIS data processing and exchange. The UniScan™ ground station is capable to receive data in X-band with data rates up to 170 Mbps (in one channel) from different international remote sensing satellites: Terra/Aqua, IRS, EROS, RADARSAT-1, Monitor-E, SPOT-2/4 and others. French SPOT 2/4 satellites images are being received on all daily orbits over Russia and successfully used for fire damage assessment. The electronic web-catalog service makes it possible to find stored images or to order new ones. UniScan™-based EOStation on-line web-access has been used by the forest fire-protection services on the regional level in Irkutsk, Siberia (<http://eostation.irk.ru/>) since 2003.

1. REMOTE SENSING CENTER WITH UNISCAN™ GROUND STATION

Forest fire monitoring is an important task in Russia with 20% of the world forest. Satellite forest fire monitoring is widely used based on NOAA and MODIS data. However, according to the fire protection specialists, low resolution images are not enough for fire evaluation and arrangement of fire-fighting activities, forecasting and damage assessment. Additional middle resolution images of SPOT, IRS and Monitor satellites are required.

ScanEx Center has developed an integral solution for reliable forest fire detection based on low resolution images, analysis of related data, damage assessment and obtaining of the necessary additional information using middle resolution images of different remote sensing programs. The new technology is very important for Russia, where satellite-based monitoring is the only way to control the fire situation on the vast territories of Siberia with low population density and poor transportation, as well as Siberian maps that have not been updated for a long time.

The backbone of such integral solution is the regional satellite monitoring center, equipped with the universal compact UniScan™ ground receiving station. The UniScan™ ground receiving complex, designed by RDC ScanEx, enables to receive data from 12 different remote sensing satellites at the data transmission rate of

up to 170 Mbps: Terra/Aqua (USA), IRS-1C/-1D/-P6 (India), Monitor-E (Russia), SPOT 2/4 (France), RADARSAT-1 (Canada), EROS-A (Israel), Landsat-5 (USA), Envisat-1 (ESA). New satellites, such as EROS-B and IRS-P5 can be enlisted in the near future.

The indicated RS programs make it possible to receive a wide-coverage low resolution picture in real time and to get more details about the objects with the help of middle and high resolution images. Two types of data are used during the forest fires satellite monitoring:

- TERRA/AQUA program data (MODIS sensor) with low resolution (0.25-1 km), acquired in real-time for the on-line fire detection, localization and acreage determination, offering real-time web-access to the processing results (using the EOStation technology);

- SPOT-2/4 satellites images (resolution of 10 and 20 m) and IRS data (resolution of 6-56 m) with licensed data acquisition, which is available via the electronic web-catalog and can be used for thematic maps updating, GIS-layers development, situation assessment and decision-making.

2. WEB-ACCESS TO EOSTATION AND CATALOG

The ScanEx remote sensing center in Moscow is supporting the archive of IRS and SPOT images covering almost the entire territory of Russia,

with the electronic web-catalog for search, preview and express analysis of the required images. SPOT-2/4 images being transmitted from the satellites on all passes over Russia became the most optimal resources in 2006. UniScan ground stations in Moscow and Irkutsk have been receiving SPOT-2/4 data.

Web-access to the electronic catalog allows for the on-line search of the target SPOT and IRS images of middle and high resolutions for further analysis of fire situation and a justified decision-making.

The fire detected using MODIS sensor on May 5, 2006 on the European part of Russia, is taken as an example (Figure 1). Fire spot coordinates were detected in real time. The search for the target SPOT-2/4 images of middle resolution was done based on the fire spot coordinates using the electronic web-catalog <http://catalog.scanex.ru>. A SPOT-2 image from

an earlier date of May 1, 2006 was found in this catalog with the early fire development phase. (Figure 2). Middle resolution image ensures a better information value than that of MODIS, sufficient to assess the situation and to take a decision on fire fighting.

3. CONCLUSION

Integral solution for real-time fire monitoring has been developed, based on regional remote sensing center with UniScan universal ground station, real-time data processing modules with web-access, and data archive with electronic web-catalog. Customer can use results of the on-line MODIS data processing with appropriate SPOT and IRS medium-resolution images for fast data assessment and disaster management.



Figure 1. Low resolution (250 m) MODIS image, May 5, 2006, fire in Murom Region, Russia. Data were processed and accessible on web-site by EOStation technology

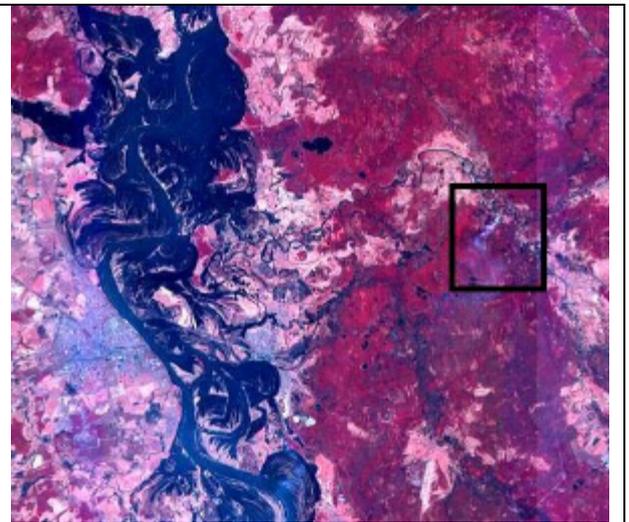


Figure 2. Middle resolution (20 m) SPOT-2 image, May 1, 2006, developing fire in Murom Region (in black box), Russia. Image is found in the ScanEx electronic catalog.