

# «SPACE» EDUCATION: HIGH QUALITY AND TEACHABLE

## V. Ippolitov (ScanEx RDC)

In 1991 graduated from the Gubkin Moscow Institute of Oil and Gas, Department of Geology, Geophysics and Geochemistry (currently – Gubkin Russian State University of Oil and Gas) with major in mining geology. Worked at the University after graduation. In 1993 – jointed ScanEx RDC. In 1994 - VNIIGAZ. Since 1995 has been working in ScanEx. Currently – General Project Manager.

## N. Pupysheva (ScanEx RDC)

In 2008 graduated from the Lomonosov Moscow State University (MSU), Department of Geography, with major in Geography. Since 2005 worked in the Laboratory of Comparative Planetology at the Institute of Geochemistry. During the study at the university worked at the Mass Media Center of the MSU and in 2008 – in the “Vuzovski Vestnik” newspaper. After graduation has been working in ScanEx RDC as a press secretary.

Reforms of higher education system in Russia have been ongoing for more than 10 years. It is still important to detect the level of competence of specialists, working in different spheres. Currently, the ability to systematize, analyze and to optimize large volumes of data and to work under the conditions of quickly changing technologies becomes a must for a skilled expert. It's no secret that Earth remote sensing data are applied wider both for decision-making and for studying different processes and events. Proficiency in using space data simplifies and increases the efficiency of human activities.

In order to master modern technologies and to select a promising and an “in-demand” job, it is important to introduce spatial data processing methods and technologies into secondary and high school education practices. Thanks to ScanEx RDC developments the usage of RS data in education became a reality. The manufacturer and supplier of firmware and services ranging from Earth observation data reception to thematic processing – ScanEx R&D Center – paid much attention to such educational projects as creation and support of Remote Sensing Data Reception Centers at higher schools and

universities, of satellite data training programs in schools. Fresh data, received from space, becomes available due to the ground receiving stations, developed by ScanEx RDC. These stations are small, simple and affordable in price, having an integrated technology of data storing, processing and thematic analysis. In addition, specialists of the R&D Center have created respective software applications for preliminary RS data processing and archiving, as well as for further in-depth thematic processing, creation of mosaics, maps, indices and 3D models.

Remote sensing data reception center, based on ScanEx's technology, are currently operating in Russian universities. In September 2006, the universal UniScan-24 ground receiving station was supplied to the Center of Space Geoinformatics at the S. Korolev Samara State University, enabling the reception of RS data acquired from Terra/Aqua (USA), SPOT 2/4 (France), IRS-P5 and IRS-P6 (India), EROS A/B (Israel) and RADARSAT-1 (Canada) satellites. Nowadays, this Center of Space Geoinformatics is recognized as the leading center of space monitoring not only among Russian universities, but throughout the world in a number of criteria. Besides using space data for educational purposes, scientific studies and practical research work in a variety of activities are carried out at the center (agriculture, land-use planning, cadastre, etc.). For example, based on the regional space imagery archives with the capacity of operational updating, the Samara Center has developed a regional GIS system for agribusiness.

In August 2008, the UniScan-24 station was installed at the R&D Institute of Ecology and Nature Conservation of the Tyumen State University. This complex is currently running in test mode for reception of Terra (MODIS) data with resolution of 250, 500 and 1000 meters. Data cataloging is being tested as well. In addition, the station is equipped with assets to receive and process SPOT 2/4 data with the license for data reception throughout 2009. The universal UniScan-24 ground receiving complex, being upgraded and having proper license is capable of receiving data from other RS satellite of different countries. The receiving station, deployed at the Tyumen State University has a footprint of over 2000 km in radius, including Tyumen Region and adjacent Russia sub-regions and neighboring countries.

In December 2007 and in October 2008 ScanEx RDC equipped the R&D Center of Krasnoyarsk Siberian Federal University with two receiving, archiving and processing stations UniScan-26 and Alice-SC. Alice-SC station receives meteo-data, transmitted from the polar-orbiting NOAA (USA), MetOp A (ESA) and FengYun (China) satellites. The installed at the Siberian university universal firmware complex UniScan-36 provides reception and processing of data, delivered from the electro-optical system of RS satellites with the spatial resolution from 1 km to 1.8 m: Terra, Aqua, IRS P6, EROS A and SPOT 2/4. December 2008 was marked by

commissioning of the UniScan-24 ground station at the Southern Federal University in Rostov-upon-Don.

Thanks to UniScan-24 station the university employees got access to Terra and Aqua satellites images acquired from MODIS sensors that transmits telemetry in 36 spectral ranges with 250, 500 and 1000 meters of resolution. Along with the UniScan-24 station ScanEx specialists installed at the Southern Federal University a tutorial geoportal, developed based on kosmosnimki.ru service ([www.kosmosnimki.ru](http://www.kosmosnimki.ru)).

Highly detailed IKONOS images (0.8 m resolution) of Rostov-upon-Don, IRS 1C/1D data (India) with 5.8 m for the territory of Rostov Region, as well as Landsat 7 (USA) with 15 m resolution for the territory of the Southern Federal District are available within the frames of the training geoportal. ScanEx Web GeoMixer as the core and the geoportal engine enables to combine different data types in one on-line project, to operate in raster and vector formats at the same time, to connect meta databases and search through those databases. IN its turn, the receiving complex UniScan-24 will enable to update and replenish geoportal data in real-time.

Centers of space monitoring based on UniScan type ground stations (Fig.1) currently operate in other Russian universities: Altai State University (R&D Institute of Ecological Problems, Barnaul), Belgorod State University (Astrophysical Laboratory) (see Geoprofi, 2005. — № 1. — pp. 58–60), Astrakhan State University (Cartography and Geoinformatics

Department), Moscow State University, Bauman Moscow State Technical University and others. In addition, ScanEx's developments have been introduced on the basis of the Kazakhstan State Institute of Systems Modeling and of the Kazakhstan Technical University after Saptaev, as well as at the Spanish universities (Valladolid and Valencia). Ground receiving complexes, installed at the universities, consist of not only personal stations, but the software, enabling to resolve tasks of data primary processing, archiving, cataloging and creation of thematic products, etc. The most popular are the following software applications:

— ScanMagic, enabling to view, analyze and process Earth remote sensing data;

— ScanEx Image Processor, designed for preliminary and thematic rprocessing of space images, creation of end products in form of maps and 3D models, export of data into GIS and image processing systems, using neural technology of data processing, etc. As a result of the agreement between the international operator of EROS program ImageSat Int. N.V. (Israel).



Fig. 1  
UniScan ground receiving station  
(Moscow State University)



Fig. 2  
Awarding the winners of the Internet  
contest «Living Map»



Fig. 3  
Alice-SC ground receiving station (Lensky  
Territory, Yakutia)

and ScanEx RDC the universities in Russia and worldwide received the possibility to use space images acquired from EROS A 1.8 m resolution satellite for education and scientific purposes. Currently UniScan-24 station can be supplied to the universities around the world on flexible financial terms with the license to receive 100 scenes of EROS A during the first operation year being the part of the station delivery set. The exclusivity of the proposal is in the fact that such systems are usually offered to large state-run departmental centers of space information reception. Whereas in Russian universities and in many other countries, usually stations, enabling mostly to acquire free data at 250-1000 m

resolution are installed. Universities obtain an actual possibility to start receiving highly detailed EROS A data on favorable financial conditions.

Many projects, supported by ScanEx RDC, are carried out for school children. The annual interactive Internet-contest «Living Map» (Fig.2) for using Earth observation images is attended by schoolchildren from Russia and CIS countries.

Under support of ScanEx mobile school sessions, training courses for educational institutions of secondary and high school are carried out for the application of remote sensing data.

At some Russian schools Alice-Sc ground receiving stations are installed (Fig.3) enabling to study vegetation and snow cover, meteorological and ice conditions, floods, hurricanes, fires, etc. based on satellite images. Using ground stations, RS data is regularly transferred directly to a PC a school in real-time mode. The traditional project of ScanEx, aimed first of all at making remote sensing data usage popular when resolving a wide range of tasks, is the contest for the best space images application idea.

In 2008–2009 the contest is performed in three sections: space data application in science and education, in business and management, in design and creative work. Russian and CIS citizens will take part in it: teachers, scientists, specialists in GIS, RS, geology and geography, designers and professionals of allied crafts. Required space images and processing

software are provided to the competitors for free, whereas prize winners in each session will get vouchers, equivalent to the following sums: 1<sup>st</sup> place – 150 000 rubles, 2<sup>nd</sup> place – 90 000 rubles and 3<sup>rd</sup> place – 30 000 rubles. The contest awards will be given during the 4<sup>th</sup> International Conference «Earth from Space – the Most Effective Solutions» on December 1-3, 2009, which a biennial even, organized by ScanEx RDC and NGO Transparent World and is one of the most important events in sphere of remote sensing in Russia and CIS counties. The current trend of expanding space data application for solution of different economic tasks should be based on fundamental tools. The efficiency of such application in practice depends on the knowledge level and experience in using space data. Space technology introduction rate and remote sensing data training programs implementation at educational institutions have a direct impact on the possibility of Russia to push forward the plans on building a knowledge-based economy in the country.

#### RESUME

The remotely sensed data usage for education in universities and at schools in Russia becomes more and more available due to the space data receiving systems created on the basis of technologies developed by the ScanEx R&D Center specialists. The centers based on these systems include not only personal stations but also software for the data preliminary processing, archiving, cataloging and creating thematic products for different purposes, etc.