

Vladimir Gershenzon:

There is no sense in driving nails with a microscope if you have a hammer

These days Earth observations from space are increasingly universal in nature everywhere in the world. Operational, objective and independent space monitoring is the tool that becomes available for use by authorities, supervising agencies, non-governmental institutions and business. Entire range of satellites equipped with remote sensing instruments has been placed on orbit to acquire versatile information required for assessment of environmental condition, prediction and prevention of natural and technogenic disasters, meteorological, natural resources and other studies. In the recent years imagery of Earth from space has been increasingly applied for area management and economy planning.

One of the leading Russian companies providing services on reception and thematic processing of space images to order is ScanEx Research and Development Center (ScanEx RDC), which makes full cycle products – from reception technology to software and development of specialized geoservices. On the basis of license agreements ScanEx RDC operates in the mode of direct reception of data from 14 remote sensing satellite systems. Images arrive at UniScan™ ground station of own manufacture, which gives the opportunity to scan on a regular real-time basis the territory of Russia and CIS countries with spatial resolution from hundreds of meters to tens of centimeters. The center have commissioned, supported and developed departmental station networks for reception of satellite data in Roshydromet, Russian Emercom and Ministry of Natural Resources as well as regional centers for space monitoring under the auspices of educational and scientific institutions. Technologies of ScanEx RDC serve as a basis for Earth remote sensing centers in Spain, UAE, Vietnam, Nigeria, Iran, Kazakhstan, Azerbaijan, USA, etc.

General Director of the Center, Vladimir Gershenzon believes that in order to achieve higher efficiency, motivation and cost-saving in application of space imagery “the most optimal configuration needs to be chosen for solving a particular task: a combination of space, ground and ancillary remote tools depending on an issue statement, available resources and required accuracy”.

Q: How important is to use space imagery of the surface of Earth in terms of city planning and monitoring?

V.G.: Operational satellite monitoring enables controlling dynamics of changes occurring in the area in question. Received data are up-to-date, objective and subject to record. Of course, when access to some objects or areas is restricted or unavailable, space is simply irreplaceable.

Nowadays space technologies are increasingly assigned with measuring functions as well. This implies stereo imaging in the first instance, which allows receiving extra detail (submeter) images.

Certainly, Earth remote sensing from space does not provide accuracy as high as that of topographic and geodetic measurements. Space imagery accuracy as of today is first meters per pixel at best. However, it's not difficult to see, for example, if the third or fourth level of a building was erected. Space monitoring is also necessary in observation and monitoring of federal motorways construction in case the sites are not easily accessible. Of course, satellite data would not be enough to estimate volumes or sign off a work order, but one can



V.E.Gershenzon

see everything occurring on site: which section is constructed by military personnel and which section – by civilians, how successful the process of construction is, which part is paved, whether markings are made, etc.

Sometimes we are asked funny questions with regard to control over the construction process. They may ask: “Is it possible to track in detail how the construction of each building level is going on? Can one see the inner structure of a building from space?” If each level under construction was to be imaged – such possibility also exists, that would be expensive – monitoring of such building would require spending a million of dollars a year. But “why driving nails with a microscope if there is a hammer?” If detailed information is really required it could be obtained through scanning, for instance. This costs times cheaper. A task shall always be thoroughly defined to seek the optimal way of solution to this task. It’s one thing if you need a 3D model of an object for a fire certificate and absolutely another thing if it’s needed for advertising on the Internet or for a computer game.

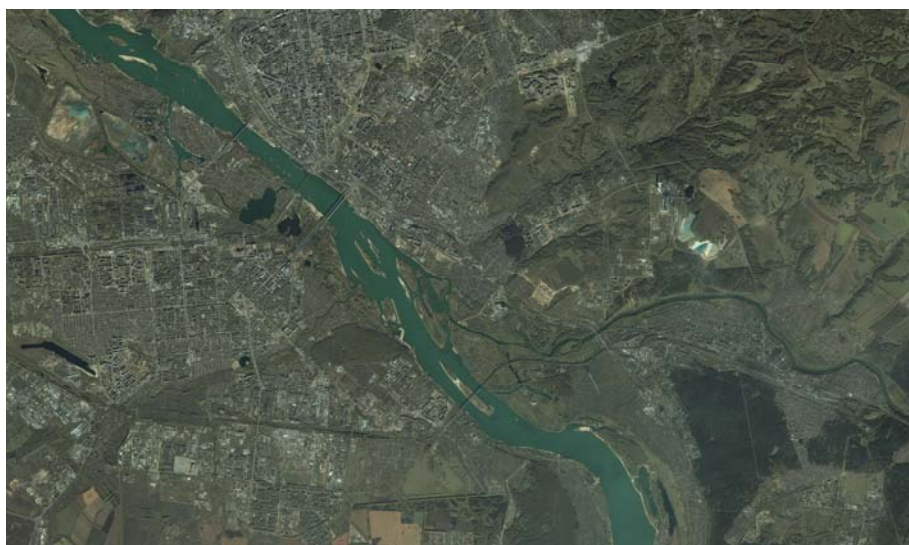
Q.: *Speaking about city monitoring carried out from space how can such large flow of data be processed? See, for instance, the Ostankino Tower or multistory buildings have quite large magnitude of swaying by wind – up to several meters. And this departure appears in different directions on images ...*

V.G.: All depends on an object and dynamics of its movements. If shifting is great interferometric techniques will produce poor results. Such object as the Ostankino Tower, sway greatly therefore an interferogram will “scatter” with a large magnitude. However, closer to the base of the tower where shifts are minor one can get some progress. Perhaps, in case of the Ostankino Tower, there is no need in scanning from space. Why can’t they install a sensor, an accelerometer with a recorder and read data from it afterwards? Cheap and effective. In other words, the issue on selecting an imagery technique is to be solved individually for each particular task.

Q.: *Can space imagery be useful for survey work?*

V.G.: Certainly. It’s important to keep in mind though that in the process of surveying many parallel tasks are handled (for instance, determination of types of plants or soils).

Another example: the Moscow Construction Complex has been more actively engaged with informatization and worked out a development program for that. To my mind, innovations are



Novosibirsk, a fragment of IKONOS mosaic (© GeoEye, SCANEX)

introduced slowly. This is because large financial resources and efforts are often spent on supporting traditional operation schemes, which pull primary efforts and financial resources. With that traditional schemes in modern conditions do not produce the same quality and often the same scope which are required for housing and community amenities, construction, etc. Therefore, our utilization of space

imagery is still very far from reaching potential.

One of the easy and popular applications is 3D-modelling, which could be done easily and quickly using space imagery data up to the scale of 1:10 000 and therefore solve the issue of timely pre-design familiarization with an area or an object to be surveyed in case of time and site accessibility constraints.

Q.: *Does your work cover nature protection and environment-oriented projects?*

V.G.: Earth remote sensing is widely used for monitoring, control and “rehabilitation” of environment. Environmental subject is multifaceted and comprehensive, potentials for using space technologies have no limit both at global and local levels. Space often overwhelms with information. Per dynamics and multitemporal images one could see what has dried out, watered or polluted. The dynamics of landscape transformation is also apparent and so are changes to forest cover, etc.

In the course of many projects we cooperated with Russian nature protection agencies and services. We provide data or technologies for their projects. In turn, nature protection agencies, services and funds make their conclusions and if required fine infringers, contact the prosecutor’s office, etc.

Satellite monitoring of forestlands helps in setting up control over logging activities, achieving controlled reforestation, performing actions, which ensure sustainable development of natural environment. Since 2005 on behalf of the Federal Forestry Agency we ensure remote monitoring of illegal cuttings and infringements of the logging regulations in forests of Russia. For the first time the system for large scale space imagery was created to satisfy forestry needs. This program was the first effective state program for remote monitoring with high spatial resolution.

In addition, we implement entire range of non-commercial nature protection and environment-oriented projects. In particular, in conjunction with WWF we carried out radar monitoring of environmental situation in the operations area of “Sakhalin-2” project and in the grey whale population habitat in the Sea of Okhotsk.

Another project of ours was aimed at monitoring environmental situation in the Caspian Sea. The objective of the project was to collect operational and objective information on oil and petroleum products pollution offshore North Caspian and provision of this information to user community via open Internet resource.

In March-April 2009 in conjunction with the International Fund for Animal Welfare we implemented the project on operational satellite monitoring of ship traffic and ship-broken passages across ice fields in the area of seal herd locations in the White Sea. Currently the project is being executed on monitoring offshore structures construction in north China near the Russian border, in particular, assessment is being carried out to grade the impact this construction has on the region environment. The project is run by “Transparent World” Non-governmental Organization with the use of our satellite data.

Q.: *Are you saying that space imagery is an important source of information for development and making managerial decisions?*

V.G.: Certainly. Data received from satellites enable development of area plans for building a common base for territorial planning maps, development of land ownership inventories and determination of their actual condition. Space imagery assists in making more accurate predictions concerning agricultural crop capacity; controlling rationality of land management; tracking actual locations of sea-going vessels including those engaged in poaching; monitoring conformity with license agreements in exploration of deposits of commercial minerals and other natural resources; detection of unauthorized construction or waste dumping sites. The range of capabilities allowing regular observation of areas or objects is still expanding.

Q.: *What is the main principle ScanEx RDC follows in their activities?*

V.G.: Democratization of access to Earth remote sensing data, i.e. shortening time of receiving satellite data and simplification of data processing and eventually cheapening of the data.

Access to space images has recently become a lot easier and Earth remote sensing techniques are increasingly applied in economies of all countries. The case with Earth remote sensing data copies the one with GPS: while the satellites are quite expensive, increase in number of consumers draws in big money in the process and makes associated services profitable. Therefore space technologies form new economy.

For instance, each new car in USA and Europe is normally equipped with GPS navigational system, which is supplemented with an important component – geoinformation system (GIS) in the form of a set of electronic maps and software loaded in the car onboard systems, so the driver can get directions on any country roads. All current GIS use space images, the quality of which is improving fast. Earth remote sensing techniques enable solving both specific industry tasks and geostrategic and political issues.

Q.: *What are the trends of developing Earth remote sensing applications?*

V.G.: Recently Earth imagery from space has been used by a coterie of specialists. State-of-the-art hardware enables reception of images from Earth artificial satellites via virtually personal access tools (so-called small-aperture space imagery receiving and processing stations “UniScan” developed and produced by our Center are considered world leading these days). The latest software makes it possible to quickly process this information and upkeep its electronic archives, which makes space imagery accessible to entire user community. Therefore satellite images are turning into a routine source of objective and up-to-date information for finding solutions to tasks in various areas of human activities.

Talking about global trends, these days no country is reserved to its national system of Earth remote sensing but purchases services and data on the global market. Earth remote sensing data are available on the Internet for each commercial organization. For instance, owing to Google Earth resource any Internet user may familiarize himself with some base set of images covering the entire planet. Formation of space imagery consumer market is well under way.

Current development of Earth remote sensing tools allows free provision of *low resolution* images to all interested parties, like it is implemented on Google Earth. Earth remote sensing images of *medium resolution* are required for operational monitoring of environment condition, identification of fires, river floods as well as for solving other environmental and economic tasks. Access to these resources should be free and this should be supported on account of state agencies. *Images of high and super high resolution*, especially those competing with aerial surveying, represent the market sector where reasonable private and public partnership is to develop.

In Russia availability of wide and quality use of space images is limited. Development of this market in our country is inhibited by the “birthmarks” of the Soviet system, in particular by classification of data. Nowadays there is neither state-adopted concept nor regulation of the issues related to use of Earth remote sensing data for civil needs, nor there developed civilized consumer demand.

Presently Russia has to purchase remote sensing materials, GIS and GPS receivers abroad. The country is dangerously falling behind the global development trends. With arrival of a new generation of foreign Earth remote sensing satellites featuring unprecedented resolution and efficiency, global geoportals and navigation technologies, Russia may irreversibly lose its positions in modern geoinformation space.

By the way, a broad spectrum of issues dedicated not only to application of satellite data but also to technologies of their reception, processing as well as specifics of legal framework in Russia in the

area of space imagery, will be discussed at the 4th International Conference “Earth from Space – the Most Effective Solutions”, which will be held on December 1-3 at Votutinki Presidential Administration Complex in Moscow Region. This is my pleasure to invite the editorial staff and readers of the “Engineering Research” to take part in the Conference.

Source The Engineering Research magazine, №9, 2009