

SATELLITE INFORMATION: INNOVATIONS FOR SCHOOL EDUCATION

One of school education main objectives in interests of a sustainable development is a comprehension of necessity of changes in an educational and educational paradigm, search of innovative techniques of teaching, involving in process of training of modern materials and technologies. In modern information society the tendency of increase of a role of the space information is obviously traced. It speaks its increasing availability and expansion of informative possibilities. The changes which have occurred in science and in life in the end of the XX-th century, promoted that geographical including cartographical, knowledge and abilities became necessary for each person in life and professional work. The purpose of this work – to show possibilities of application of the space information in the educational purposes which will help to generate certain level of geographical literacy at pupils, information will allow to become active users spatial data, will arm with an effective method of scientific knowledge. Spatially-ecological communications of natural phenomena and society, their dynamics and development forecast most rationally and visually to study with use of cartographical and satellite materials. In the Russian school program there is an obligatory acquaintance to map, and acquaintance to satellite images passes facultatively. The map represents the unified is figurative-sign kind of model of the spatial data structure, passed processing by knowledge, experience and vision of a problem of the concrete expert, while a satellite image – real model of a visible terrestrial landscape and simultaneously a correct source of the information. For pupils the territory image in satellite images will be the most familiar and accessible to the further studying. Therefore the satellite information should actively takes root into school education process. Use in school education of satellite images – its essentially new stage. Images give full, much more objective and evident, than a map sight from space in real time, reflecting a current condition, dynamics of terrestrial objects and processes. Instead of descriptions of various geographical objects, the phenomena or ecological situations by means of satellite images they can be seen.

With pupils it is always important to find such ways of training which on the one hand, would help to form ability to think competently in work, and with another – have not averted the child from the further process of knowledge. The best result in that case gives a combination of the theory to practice: formation and fastening of concepts on the basis of studying of the region not only is more interesting, but also is more effective. The plots considered in article were developed for two training multimedia projects focused on pupils of Hvalynsk city in Saratov region and Kirillovsky area of the Vologda region. Methodically some tasks do not

differ from each other, only in their basis images on different territories lie. Some tasks consider historical and geographical features of regions. It gives the chance to experts to open to a wide range of maps trained the fascinating world, satellite images and other geoimages, to generate special «ecological outlook», to expand an outlook and to raise culture of dialogue with the nature. But geoimages should be exact, attractively issued and interesting under the maintenance. Therefore most a complicated question – what to show to the trained? At an initial stage of training of work with satellite images it is possible to suggest for them to define most easily decrypted objects on satellite images. We will admit that the satellite images has come into the hands to the person who sees for the first time satellite images. To it well-known territory on which the images (for example, to the local resident is made). The first that rushes to it to eyes are objects of the validity which are clearly visible in satellite images in a reduced form: timberlines, agricultural fields which have in a picture the correct geometrical forms, the largest rivers of region, roads etc. In the developed project it is offered to define: the Saratov water basin, Hvalynsk, road "Syzran-Saratov". Further it is necessary to pass to comparison geographical map and satellite images. It is possible to offer participating in training to define what colour various territories and water areas on map and satellite images are represented; what it is possible to find out similarities and distinctions; what objects are is better visible on map, and what on satellite images; that it is possible to see in satellite images, but it is impossible on map, or on the contrary etc. By consideration of a coastal line it is interesting to look at its configuration in image from space and to compare to map data. Comparison of satellite image and map in the project is solved by means of a method of "a sliding window».

For many years on Earth orbit work satellite systems of various companions which transfer thousand satellite images. Images turn out different detail and scale is and large-scale on which motor vehicles in streets are visible even, small-scale where cities look in the form of light points. Different coverage and the spatial permission of images allow to study processes of different scale. All objects of the validity which are shown in images in a reduced form, have one feature – images on them generalized, that is properties of objects are generalized (basically it concerns the sizes and brightness). Generalization geoimages depends on technical parameters of shooting and natural features of territory. Generalization in satellite images differs from cartographical that the cartographer at map drawing up makes generalization in a purposeful, creative direction that it is impossible to tell about shooting from air where generalization is unpredictable. The concept of generalization in satellite images is considered in a video clip demonstrating dependence of detail of the image from various parameters of shooting on an example of structure of Hvalynsk city. Perfection of

satellite systems has allowed to receive multiseasonal satellite images, that is made on the same territory during different seasons of year. In projects are used as images of the warm period of a season, and on the winter. Pupils are offered to consider one of modern images with the high spatial permission, made in the winter period. On the given image it is possible to define an unaided sight the forest communities which have been not covered with a snow cover as brightness of two (snow and trees) objects sharply differs. Forest shelter belts which it is accurate as a ruler draw the agricultural fields which are under snow can be other example of image decryption. With the help of high spatial permission images it is possible to characterize approximately height of a grassy circle on agricultural fields. So at small enough snow cover it is possible to define with low accuracy distribution of fields with the winter crop. The winter image in the course of school training can be used as a material for an estimation of a partition of a relief erosion. On a fragment of a winter picture it is visible, as erosion system cut agricultural fields, in the summer negative forms of a relief disappear under a high grassy cover. In the project the task which gives the first skills of image decryption to pupils is developed: on image fragment it is necessary to put correctly erosion forms of a various configuration which are located behind a picture field.

For more reliability on the same territory receive simultaneously not one, and some images in various zones of a visible and near infrared range of an electromagnetic spectrum. Such images name polyzonal. In the educational project it is offered to analyze the image of woods in national park "Hvalynsky" in images with a various variant of synthesis of zones. Up until that time work with images at schoolboys went that is called "instinctively", but the further plots demand more vocational training. Therefore concepts «signs of decryption» should be entered. Among them allocate direct and indirect. The decryption signs are: the object form, its size, colour, a shade, drawing and an image structure. In the project each of decryption signs is separately considered. The object form - is used basically for recognition of anthropogenic objects as they have correct outlines that it is impossible to tell about natural objects of the nature as the nature does not suffer straight lines. Colour - allows to define objects by brightness. So, for example, in a spring image it is possible to define precisely enough distribution winter crop on agricultural fields. If to use a summer multispectral image it is possible to observe of diversity of agricultural fields, with the help of distinctions as a part of vegetative communities. Another decryption sign which allows to define the spatial size of object, is the shade. So many high buildings have the big shade, than usual small houses. Another important, but already indirect decryption sign is the interrelation, interconditionality. Examples it is possible to result much, but we have stopped on the most widespread: There is a road which crosses the river and proceeds after, but on the river there is no bridge, therefore

it is possible to assume that in this place ford. To indirect signs it is possible to define type of roads so the railway has very smooth transitions, at a highway sharper, and electricity lines incorporates under 90 degrees that allows to allocate various types of anthropogenic linear objects. Then it is possible to enter the kinds of works demanding more difficult operations—such, as deducing of laws which are traced in images. Many natural and economic objects have the characteristic drawing of the image inherent only by it, and at the first sight skilled of image decryptor will define that before it.

Satellite images give the chance to conduct own researches — to study change of vegetative and snow covers, meteorological and ice conditions, flooding, hurricanes, temperature of a surface of ocean and oceanic currents, fires, volcanic activity, dusty storms. All materials allow to see the key processes occurring in the nature, in real display, to track their development eventually. It is offered to consider spring satellite image (20.04.2002) - as a material for definition of breeds of a forest circle. A distinctive feature of this image is well expressed coniferous vegetation as in needles the chlorophyll necessary for photosynthesis contains, and, as it is known, coniferous for the winter do not dump needles, everything, except a larch. Therefore the maintenance of chlorophyll in the spring in coniferous breeds above, than at other trees that is reflected in various spectral zones, it allows to decode borders of distribution of coniferous breeds distinctly. Other kinds of plants on a spring picture to distinguish very difficultly, and in most cases it is impossible, if there are no given field researches. On an example of a small forest plot of national park "Hvalynsky" training works on visual decryption forest communities are offered. For achievement of the greatest accuracy field researches by definition of pedigree structure have been conducted. Training visual decryption should be spent to some stages. Coniferous breeds, as most easily decrypted are to begin with allocated. Allocation small-leaved or deciduous breeds, in image at them various colour, brightness and a structure should be a following stage. But the border between them is decoded not accurately. For branch of contours of distribution small-leaved and deciduous breeds the digital model of a relief on which it is possible to estimate in 3-dimensional kind border between communities already is required, and to adhere the field data. The decryption scheme of studied area should become result of work. Definition of a site of cuttings down of large forests can be one more variant of use of satellite materials in ecological education. For the decision of this problem can it is applied both visual, and automated decryption.

In the first case of cutting down are defined on a geometrical outline of contours of cuttings down, in the second – on age features decryption signs of young plantings of wood.

The offers set forth above basically are focused on local pupils of the senior classes for whom ecological education on an example of Hvalynsky national park, is included into additional school education and is faster compulsory process, than voluntary.

The formation problem – not to frighten off complexities of statement of a material. For understanding of the various processes occurring in the nature, the big role animation mapping can play. By working out of illustrative plots of this type satellite images were actively used. For example, change of external shape of a landscape during various seasons. The picture made during the summer period on which snow falls is for this purpose presented, and it is gradually transformed to a winter picture. Or formation of time water currents after a strong rain: on the image of a summer picture in parallel with loss of deposits there are streams, merging, they bear waters to Volga. Animation of a spring by training that is very important for territory of the Hvalynsky national park which is famous for the medical sources is separately created. For pupils of Kirillovsky area the animation illustrating flooding of the Sheksninsky water basin is most actual.

Use of pictures allows to solve a number of the problems facing to modern formation in a complex. Them concern: - Application of the received knowledge in various school subjects (computer science, geography, biology, ecology, economy, physics); - training to interrelations of the nature and a society on an example of the modern technologies giving possibility to spend work to users of different level that gives the chance to carry out the approach differentiated on complexity to training; - realization of projects which give motivation to the further studying of interrelations of the nature and a society.