

RUSSIAN INTERUNIVERSITY AEROSPACE CENTRE FOR CARTOGRAPHERS AND GEOGRAPHERS EDUCATION IN REMOTE SENSING

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Abstract

The activity of the Interuniversity Scientific and Methodological Centre for Aerospace Methods of Research and Mapping is described. The Centre was established at the Faculty of Geography, Moscow State University, to render scientific and methodological assistance to other universities of this country in organizing the up-to-date courses of studies on remote sensing methods in research and mapping. The work of the Centre is organized mainly in the form of short-term intensive training courses for university teachers and as workshops that are held every 1.5 or two years. During 17 years the Centre has organized 8 workshops of this kind concerned with particular stages of development of the remote sensing methods of research. Their themes were connected with aerospace methods application in geographical investigations, field undersatellite observations, interpretation of multiband aerospace images, computer methods of image processing and interpretation, aerospace monitoring, space images use in school education, remote sensing and geoinformatics, educational GIS.

1 Introduction

Swift development of space methods in geographical investigations have advanced the problem of remote sensing education in high school. Universities of Russia and of the Commonwealth of Independent States provide thorough training in aerospace methods to the students of natural sciences. In 1978 the Interuniversity Scientific and Methodological Centre for Aerospace Methods of Research and Mapping was established at the Faculty of Geography, Moscow State University, to render scientific and methodological assistance to other universities of this country in organizing the up-to-date courses of studies on remote sensing methods in research. Aerospace Methods Laboratory of Cartography and Geoinformatics Department became the head of the Aerospace Center. Leading scientists and experts from academic institutes and other centres engaged in the space research program of our country cooperate in the Aerospace Centre's activities.

2 Training courses and workshops

The Center contacts with more than 30 universities. The work of the Centre is organized mainly in the form of short-term intensive training courses for university teachers and workshops that are held every 1.5 or two years [1]. During 17 years the Centre has organized 8 workshops of this kind concerned with particular stages of development of the remote sensing methods of research. In 1978, when the new university courses had been organized due to the fast progress in space surveys, the first collective training of university teachers was held. It was devoted to the new courses introduced by the Ministry of Higher Education, i.e. "Aerospace Methods of Geographical Research" and "Space mapping". Training sets of space images and slides for these courses had been prepared for those universities lacking the space survey materials at that time.

In the end of 70-ies ground surveys in support of remote sensing were in progress to give the effective use of space imagery. Therefore the Elbrus station of the Faculty of Geography at the Central Caucasus became the place where the workshop concerned with the ground surveys at a high-mountain region was held in 1979. The apparatus for ground surveys, as well as the airplane- and helicopter-based measuring complexes were brought to the Elbrus region. The participants visited the airplanelaboratory, made aerovisual observations from helicopter and field interpretation of different types of images.

The advent of multiband survey, which has found wide application in space research, required new methods of image interpretation. These were the main subject of workshops in 1980 and 1984 - "Interpretation of multiband aerospace images" and "Exchange of experience in the application of the Atlas "Interpretation of multiband aerospace images" for educational purposes". In that time the basic research on the development and use of the multiband survey method was carried out. In the 80-ies the series of monographic collections "Space survey and thematic mapping" were published by the Center [2]; two volumes of the atlas "Interpretation of multiband aerospace images" [3] were issued as a result of the international cooperation, providing the basis for these workshops. Universities were supplied with atlases and the specially-issued set of space images.

Wide use of computers for research purposes and the development of methods of the automated processing of space images in the 80-ies made it necessary to extend the appropriate training of teachers. In this connection the workshop on the "Automated interpretation of aerospace images" was held in 1988. A series of studies on the application of the automated processing of space images in different branches of geographical research took place. They were based on the special complex of automated interpretation (CAI) designed at the Faculty of Geography, Moscow State University, as well as the SVIT complex. The experience of this workshop and the training tasks especially prepared for it formed the basis of the original practical course on the automated interpretation with the appropriate manual issued in 1990 [4].

Recent "ecologization" of the Earth's sciences and the development of environmental monitoring accounted for the organization of the workshop on the "Aerospace monitoring of a mountain territory" that was held in 1985 in the Elbrus region. The participants carried out the photo-theodolite resurvey, aerovisual and field interpretation of resurvey materials: they were supplied with the sets of multitemporary images for the high-mountain region. Methods of nature dynamics investigation have been characterised in special book, prepared by the Center [5].

In January and February 1993 the workshop on the "Space images in school education" was held. This subject was dictated by the fact that at present it is extremely essential to develop the ability to use the space information since school years, because even small children come across the space images in their everyday life now. The images help children with their inherent specific image-bearing type of thinking to form the true spatial picture of the world. The universities teachers became acquainted with the experience of the use of space information in school education and the development of new manuals for these purposes. A series of practical lessons on the application of space imagery for teaching the geography in secondary school was held on the basis of the school atlas "Space - for the Earth" that was compiled at the Faculty of Geography [6].

For the Russian peculiar the system of university education, with its different levels in the regions but with common academic programmes, the questions of scientific and methodological integrity and uniformity of educational courses are very important, especially for so specific course as "Geoinformatics", which has been included into universities educational programme in 1995. In connection with it the next workshop "Remote Sensing and Geoinformatics. Educational GIS'S" was

held in Moscow in January 1995. The programme of the workshop was include lectures of leading Russian scientists and the professors of the Moscow University, excursions to Digital Mapping Center of Russian Goodesy and Cartography Survey, the practical training with the educational GIS developed for the territory of the research and the training station of Moscow University and the discussions of the NCGIA Core Curriculum, which was translated into Russian by the Center.

The program of the "Universities of Russia" providing for the progress in the basic research, the new form of activities of the Interuniversity Aerospace Centre has been proposed, namely the joint research projects on the "Development of Educational GIS" and "Compilation of the Atlas "Space Methods of Geoecology""

3 Development of educational GIS

The proposals for the project "Educational Geoinformation Systems" proceed from the fact that the geoinformation technologies are intensively introduced into geographical studies, various spheres of practical activities and education. The main aid in mastering these technologies should be the specialized educational GIS that is regarded as an interdisciplinary training appliance. The principal aim of such a GIS is to help students in learning the geoinformation technologies through their own solution of geographical and cartographical problems, to provide the information and software support for practical training and laboratory works.

The principal educational GIS is developed as an integrated and local one for the territory of the training ground, because many faculties of natural sciences have such training grounds: it will include five common subsystems, such as data acquisition, conversion and input, storage and retrieval, processing and analysis (modeling included), representation of results. The principal educational GIS will be developed using the IBM-compatible computers. The commercial package of EPPL7 is used as a software shell at the initial stage.

Since the educational GIS is developed as an integrated one the concept of image application in educational GIS is being elaborated. This concept is closely related to the definition of GIS and to the tasks of new GIS in teaching different university courses, such as "Fundamentals of Geoinformatics", "Aerospace Methods", "Space Mapping", etc. It is advisable to create a separate block of "Images" in the educational GIS. The principles of image application in the educational GIS can be classified into three groups:

- Images form the main layer of the educational GIS; they are used for spatial and geometrical referencing of information in the database.
- Materials of automated processing and interpretation of images by GIS-technologies are used to create new cartographic layers in the database of the educational GIS.
- Images are used as the information support for training tasks concerning the application of GIS-technologies for solution of the problems of inventory, assessment and dynamics.

The pilot investigations on the compilation of layers of the educational GIS are carried out at the training and research station of the Moscow University in the Kaluga region that is 25 sq.km in area.

4 Text books and manuals creation

The Aerospace Center accounts very important the text books preparing for remote sensing study courses. The text books had been published by the Center include the fundamental courses, common for different specialities in Earth sciences [7] and specialised text books - for cartographers [8], specialists in environment investigations [9,10], socio-economy geographers [11]. Theoretical courses

are supplied with laboratory-works and some manuals for practical work with airphotos and space pictures have been prepared [12,13]. Special educational sets of space pictures and manuals for their use were prepared for supplying universities with space images [14]. A series of atlases on multiband pictures interpretation, published in cooperation with German specialists in 3 languages (Russian, English, German) [3] also are using very intensive by universities teachers. The Center also have prepared special manual on images machine processing [4]. It includes practical tasks for work with digital space pictures on investigation of spatial relationships of landscape components, study of evolutionary changes, geographic modelling and forecasting.

The Laboratory of Aerospace Methods of the Department of Cartography and Geoinformatics is the official distributor of the "Core Curriculum in GIS" that was developed by the US National Centre of Geographical Information and Analysis (Santa-Barbara, California). This course has been recommended for universities of Russia; it has been translated and distributed into 23 universities by the Interuniversity Aerospace Centre. The activities of the Interuniversity Aerospace Centre within the framework of the above-mentioned joint projects seem to strengthen the present-day trends of "ecologization" and "computerization" of aerospace education at the universities of this country. The future meetings of teachers also will concern the ecological application of space information and the use of geoinformation systems for educational purposes.

References

- [1] Книжников Ю.Ф., Кравцова В.И. Межуниверситетскому учебному аэрокосмическому центру при Московском университете - 15 лет. Известия высших учебных заведений, Геодезия и аэрофотосъемка, 1992, N6, с.127-135, Москва
- [2] Космическая съемка и тематическое картографирование (ред. К.А.Салишев, Ю.Ф.Книжников). Изд.МГУ, 1979, 232 с.; 1980, 272 с., Москва
- [3] Atlas: Interpretation of multiband aerial and space images. Methods and results. V.1. 1982. 86 p.; V.2, 1988, 104 p., Moscow-Berlin
- [4] Космические методы изучения среды. Автоматизированный аэрокосмический практикум (ред.А.П.Капица, Ю.Ф.Книжников). Изд.МГУ, 1990, 143 с. Москва
- [5] Книжников Ю.Ф., Кравцова В.И. Аэрокосмические исследования динамики географических явлений. Изд.МГУ, 1991, 206 с., Москва
- [6] Цыпина Э.М. Космические снимки в школьной географии. География в школе, 1993, N1, с.4-6, Москва
- [7] Книжников Ю.Ф. Основы аэрокосмических методов географических исследований. Изд.МГУ, 1980, 137 с., Москва
- [8] Кравцова В.И. Космическое картографирование. Изд.МГУ, 1977, 170 с., Москва
- [9] Кравцова В.И. Материалы космических съемок и их использование в географических исследованиях. Изд.МГУ, 1980, 98 с., Москва
- [10] Кравцова В.И. Космические методы изучения природной среды. Современный фонд космических снимков. Изд.МГУ, 1992, 135 с., Москва

- [11] Аэрокосмические методы в социально-экономической географии (ред. Ю.Ф.Книжников). Изд.МГУ, 1983, 203 с., Москва
- [12] Лабораторные работы по курсу "Аэрокосмические методы в географических исследованиях" (для экономико-географов). Изд.МГУ, 1982, 111 с., Москва
- [13] Брюханов А.В., Книжников Ю.Ф., Кравцова В.И., Ушакова Л.А. Аэрокосмические методы географических исследований: учебное пособие для физико-географического потока географического факультета. Изд.МГУ, 1987, 97 с., Москва
- [14] Кравцова В.И., Козлова Е.К., Фивенский Ю.И. Космические снимки. Изд.МГУ, 1985, 126 с. и набор из 96 снимков, Москва
- [15] Application issues in GIS. NCGIA Core curriculum (ed.M.Goodchild, K.Kemp). National Center for Geographic Information and Analysis University of California. 1990. vv.1.2.3. Santa Barbara