

SPACE DATA IN THE NEW RUSSIAN GENERAL GEOGRAPHIC ATLAS OF THE WORLD

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The new third publication of general geographic atlas of the world in difference from first two publications (1954, 1967) at first time contains the space photographic images. The space images must represent the appearance of different regions of the world, their unique or typical landscapes, character of planning of the capitals and other large cities, the natural peculiarities of the surrounding terrain. For these aims the space photographic images (contact and enlarged) at the scale of from 1:50 000 to 1: 1 000 000, obtained from Russian satellites and orbital stations are used. The atlas contains about 50 space photographic images. Their arrangement in the atlas is carried out on geographic principle as well as in accordance with sequence of maps. Images are accompanied by annotations, giving the brief geographic characteristic of the terrain and explaining the geographic objects visible on the image.

1. Space photographic images in atlases and map series

Space photographic images more frequently are published in the large cartographical works: complex world, national and regional atlases as well as some thematic (branch) atlases and map series as it was in first years after the beginning of space survey, they transferred into the type of conventional images together with the cartographical ones. But in the large cartographical works the space images are used rarely and usually in a form of illustrations altogether with the terrestrial photos. At the same time with the carefully developed concept of atlas and determining in it the position of space photographic images including into atlases these images can essentially improve the quality of cartographical work, reflect many geographical aspects in a number of cases better than maps, but in other cases - considerably improve the interpretation of theme together with maps [1-6].

In the last years in our country some large cartographical works ('Atlas of snow-ice resources of the World', Atlas named 'Nature and the resources of the Earth', General Geographic Atlas of the World etc.) in which the space photographic images are widely used are developing; the large preliminary scientific-research work on the development and realization of conception of the aerial-space support of these cartographical works has been carried out.

2. New publication of Atlas of the World

At present on Mapping Production Association 'Kartografija' of Federal Service of Geodesy and Cartography of Russia (Roscartography) the new (third) publication of scientific-reference General Geographic Atlas of the World is preparing; this Atlas is the largest cartographical work having no analogy throughout the world both on the volume of data and on the scientific well-founded methods of its display in the cartographical form. Atlas is the fundamental cartographical work consisting from the systematized collection of geographical

maps. Contents of Atlas answer the requirements of level of modern geographical science; Atlas is the reference cartographical aid on geography of both planet on the whole and the separate areas, continents, countries. Main maps of Atlas are the geographical ones. They give the complex characteristic of terrain - the drainage, relief, soil-vegetation cover and on the social-economic data - the localities means of communication, political and administrative-territorial division, separate objects of cultural and economic purpose.

The first publication of Atlas of the World was in 1954, the second one - in 1967. For years after the second publication of Atlas great changes have taken place in the world. The political, social-economic and natural-ecological conditions in which the modern world exists have changed. The achievements of science in the field of geodesy, cartography and space researches allow to obtain and process the great volume of cartographical data including to observe the dynamics of geological processes, the level surface of seas and oceans, melting of the glaciers, building of the dams and channels, many other phenomena and the activity of man. Therefore in 1980 Mapping Production Association 'Kartografija' has begun to make the new fundamental Atlas of our planet. The third publication of Atlas of the World is published in the considerably changed form and with the completely revised contents.

Size of Atlas of the World - 31 cm x 49 cm, volume - 326 pages including with maps - 278 pp., space images - 28 pp., general section - 12 pp. and schmutztitels - 8 pp.

In accordance with the resolution adopted on the last meeting of Editorial Board Atlas will be published by the following issues:

1. Europe (volume - 55 pp.) - in 1996;
2. America (volume - 60 pp.) - in 1997;
3. Asia (volume - 55 pp.) - in 1998;
4. Africa, Australia, Oceans, Polar countries (volume - 44 pp.) in 1997;
5. Russia and post-Soviet states (volume - 59 pp.) - in 1998.

In each issue the index to sheets of all the maps is given on the title page.

The system of the largest scales (with the given format and volume) with their minimum variety and multiple correlations that ensures to carry out the comparison of maps is chosen for maps of Atlas. Main maps are given at the following scales:

Russia and post-Soviet states - 1:1 500 000, 1:2 500 000,
1:5 000 000;
Europe - 1:1 250 000, 1:1 500 000;
Asia - 1:1 250 000, 1:2 500 000;
North America - 1:1 250 000, 1:2 500 000;
Africa, South America, Australia - 1: 3 750 000.

Special position in Atlas is for the maps representing the parts on main territory at larger scale. They are the maps of the most densely populated and important industrial-economic areas, the centers of mass tourism, the separate islands, the most important channels, the straits. The scales of these maps - 1:250 000 - 1:1 000 000. The plans of capitals and the largest cities of the world are given at the scale of 1:250 000.

The number of projections used in Atlas of the World is not great that simplifies to carry out the comparison of maps. All the main maps are given in the normal conformal conical

projection. The plans of cities and territories having small area are given in the Gauss-Kruger conformal transverse cylindrical projection.

The relief in Atlas is represented by the contours and layering on the spaces of altitudes and depths. Representation of relief of the land and sea bottom by the contours and depth curves allows to show the peculiarities and variety of the types and forms of relief. Altitudes and depths, the names of orographical features are given on the maps for more complete characteristic of relief. This fact raises the prestige of the given Atlas of the World.

The drainage is represented in Atlas with the most completeness and exactness, as it is the base with which all the features are co-ordinated. The typical peculiarities of the drainage system - the types of coasts, the types of river systems, its relative density and availability of bends in the different areas, the character of water flows - are represented on the maps.

The localities are the most important features, therefore they are represented with the largest completeness. The relative density of localities and the amount of other details on the maps characterize the level of developing of territory, the degree of settling of one.

For depicting the up-to-date processes of urbanization on the large-scaled maps of Atlas the images of localities with the number of inhabitants more 100 000 are supplemented by the colour background showing the actual urban area.

The transcription of geographical names of Atlas is completely revised according the modern national materials. The third publication as the second one is published by two parallel issues on the Russian and English languages. In addition in the English-language version for the countries using the Roman alphabet the geographical names are given in the corresponding national form. For the countries having the alphabets with national letters the geographical names are transcribed by letters of the Roman alphabet according the form officially accepted for these ones. The names of states, general geographical names, conventional symbols and notes are given on the English language.

In Atlas the special attention is paid to show the modern political-administrative division of states (boundaries, centers, names), in addition all the changes which have taken place lately in the Russia, the East Europe and the other regions of the world are taken into consideration.

3. Space photographic images in Atlas of the World

During the great and long work on Atlas on the World its general programme developed in 1980 has been revised and supplemented. Such important and urgent supplement was the decision of the Editorial Board of General Geographic Atlas of the World (May 1990) and the USSR Chief Administration of Geodesy and Cartography (GUGK) to carry out jointly the scientific researches on the aerial-space support of Atlas of the World by Mapping Production Association 'Kartografija' and State Scientific-Research and Production Center 'Priroda'. The great scientific-organizing work on introducing the space data into Atlas of the World has been carried out by V.G.Brugger, T.G.Novikova, Ya.A.Topchiyan, Yu.G.Kelner. At first time the space photographic images are given in the new publication of Atlas of the World in difference from first two ones.

In accordance with general concept of Atlas of the World and the conception of its aerial-space support the space photographic images must represent the up-to-date appearance of different regions of the world, their unique and typical landscapes, character of planning of the capitals and other large cities, the natural peculiarities of the surrounding terrain. Some space photographic images answer these aim; they are the space photographic images obtained from the Russian automatic satellites which owing to their orbit allow to carry out the survey of any point of the terrestrial globe. The space data obtained from the automatic space vehicles of the 'Cosmos' series is used on the whole in Atlas of the World which is preparing to publication. The predominant majority of the space photographic images used in Atlas of the World is obtained from the automatic space vehicles of the second and the third generations of this types - 'Resource-F1' by the KFA-1000 camera and - 'Resource-F2' by the MK-4 camera. The space photographic images obtained from these automatic space vehicles have no analogy throughout the world.

The original scale of the photographic images obtained by the KFA photographic system - about 1:200 000; the ground resolution - 5 m; the size of frame is 300 mm x 300 mm; width of swath of survey - about 60 km; area displayed on one frame - about 4000 sq. km. 'Resource-F2' automatic space vehicle can frequently change the orbit altitude that allows to obtain the images at the different original scales from 1:550 000 to 1:1500 000 in width of swath of survey from 120 km to 270 km. In the scale of survey about 1:300 000 the ground resolution - 5-8 m. the size of frame is 180 mm x 180 mm [7,8].

About 200 space photographic images have been examined, analyzed and selected for solving the set task on the space support of Atlas of the World. Preference has been given to the false-colour space images obtained from the above-mentioned automatic space vehicles by the KFA-1000 and MK-4 photographic systems. The false-colour space photographic images display the Earth's surface in the conventional colours. The contrast mosaic of range of colours of these photographic image inherent in the different types of landscape, natural and anthropogenic objects allows to differentiate them with the greater reliability than by the black-and-white space photographic images. The boundaries of objects on these photographic images are more definite and sharp.

The space photographic images are arranged in Atlas of the World in the form of separate blocks before the geographical maps of sections: Russia and post-Soviet states; Europe; Asia; America; Africa, Australia, Oceans and Polar countries. 4 pages (31.0 cm x 49.0 cm) are assigned to each block of the space images; in these limits it is necessary to show the various and typical physical-geographical, social and economic conditions of the given continent. The space photographic images represent the physical-geographical peculiarities of the separate areas of continent, its large orographic units, the basins of great rivers, some features of the soil-vegetation cover, the level of developing of territory, the localities. The sequence of arranging the space photographic images in each block of single continent is accepted for following order: from the north to the south and from the west to the east; exception is permitted in that case if the said order is impossible to maintain according the conditions of arrangement of image on printed sheet.

The contact and enlarged prints of space images were used in the space support of Atlas of the World. For example, the space images obtained by the KFA camera were used for aims of illustrating the plans of cities, the detailed characteristics of territory and objects at the large

scale. So, in the block of space images for the subsection 'Russia and post-Soviet states' Moscow, capital of the Russia, and St-Peterburg City are presented by the space images obtained by the KFA camera and enlarged to the scale of 1:50 000. For illustrating the physical-geographic conditions of territories having the great area such as the Himalayas, the south-eastern part of Iran, the northern part of Spain the space images obtained by the MK-4 camera were used. For the most obvious display of landscapes on territories having very large areas the photosketches (montage from 2 to 11 space images) which are characterizing of the great scope for observation were used. So, for example, in the issue 'Africa, Australia, Oceans, Polar countries' the photosketches illustrate Great Barrier Reef, King Bay and the area of Woodburn-Grafton.

All the space photographic images in Atlas of the World are accompanied by annotations. Annotations to the space images illustrate the possibility of obtaining the useful information by images for the aims of geographic mapping and solving either scientific and practical tasks. As the qualitatively new type of information on the appearance of the Earth's surface the space photographic images have a number of valuable characteristics for geographical mapping. First of all, they are: the great scope for observation of considerable territories and in the connection with this the possibility of studying the large natural complexes as a single whole; the equal level of information on the large territories in the simultaneous survey; the objective optical generalization; the high speed of obtaining the space data; the regular repetition of obtaining the images on the same territory displayed the dynamics of changes of natural environment; the possibility of studying the remote territories inaccessible for investigation by other means; the high quality of photographic image. The introduction into Atlas of the space images raises its scientific-methodological significance; Atlas becomes more attractive and interesting; the images supplement the information having on the geographical maps; they display the real outlines of the natural and social-economic objects; the images can consider as the samples of the scientific cartographical generalization.

These qualities of the space photo data have been used in the realization of conception of the space support of General Geographic Atlas of the World. The space photographic images presented in Atlas of the World considerably improve the quality of the given cartographical work, promote the display of the modern level of the achievements of space exploration in our country and reveal the possibilities of using the space data in making the new information documents which display the up-to-date state of the natural and social-economic objects, the degree of the anthropogenic violation on the nature, the ecological state of the natural environment, the dangerous natural and anthropogenic phenomena.

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