ATLAS ON RADIOACTIVE CONTAMINATION OF RUSSIA - - A SCIENTIFIC SUMMARY OF RADIATIVE MONITORING

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Abstract

Atlas on radioactive contamination of Russia is a new cartographic issue. Its first volume will be published in 1966 by the sad tenth anniversary of nuclear accident at the Chernobyl Nuclear Power Plant.

The main goal of this issue is to present spatial regularities and intensity of radioactive contamination in Russia as well as in Belorussia and Ukrain most suffered from the accident.

1 Radiative monitoring as an information support of the atlas

Monitoring the terrain contamination had begun in the late 1950s. At the first stage of this work observation on radionuclide fallout were carried out at numerous stations. Such observations were able to present only general regularities in radioactive contamination over the vast areas.

Remote gamma-spectrum survey (in its airborne and ground-based variants) developed in the late 1950s - early 1960s gave a possibility to carry out mapping of the terrain contamination to rather small ones to investigate the global contamination.

From the early 1960s an extensive database on contamination by nuclear explosions products over large territories was compiled as well as this one on nuclear power plants activity. The amount of information had increased much more after the Chernobyl NPP accident.

Radioactive contamination of the biosphere existing for a long time makes it necessary to take it into account for planning land-use, providing the maximum radioactive safety of population. To attain this goal, it is necessary to summarize available information on radioactive contamination in convenient form for all

institutions connected with planning and control development of the territories and conducting economic activity within them. This convenient form is the atlas which is not only a source of information, but the means to obtain new knowledge, a well grounded document to make decisions on land-use economy, to work out the laws and rules in social aspect taking into account medical criteria.

Computer databases are a ground of the mapping and accompany the atlas compiling.

The data used to compile the maps of the atlas are divided into three large sets:

- control system data from zones of essential effects (local level);

- overall control data on the contamination levels from distant zones (regional level);

- data on global contamination level system.

2 Goals and purpose of the atlas

Taking into account the above mentioned notes, the goals of compiling the atlas on radioactive contamination are the following:

- to systemize on a scientific base the unique data on terrain contamination;

- to present the consequences of the greatest Chernobyl nuclear accident;

- to compile reliable and convenient maps on radioactive contamination;

- to show regularities in distribution of "clean" and contaminated areas;

- to carry out the primary radio-ecological dividing into districts on the base of data on radioactive contamination.

This atlas is intended for:

- planning economic activity on the contaminated areas including the development of the principally new basis of the land-use;

- using as standard document by distingueshing the territories under the law of Russian Federation "On social protection of citizens effected by radiation from the Chernobyl NPP accident";

- carrying out investigation on radionuclides migration, as well as ones on radio-ecology and landscape geochemistry;

- compiling databases and regional GIS on radioactive contamination.

Besides, the atlas can be used for the purpose of ecological education.

3 Requirements to the atlas

The main requirements are to ensure the reliability and the ecological objectivity as well as the modernity of the materials presented in the atlas, on rather detailed cartographic basis.

This purpose is attained by reasonable combination of the remote and ground-based data on terrain contamination resulted from the Chernobyl NPP accident, as well as by incorporating maps on the other kinds of contamination not connected with this accident.

Taking into consideration the dynamic of the processes connected with radioactive contamination, it is planned to publish annually detailed maps covering the territories where essential changes in radioactive situation take place.

4 Structure of the atlas

The atlas consists of four sections, their sequence is conditioned by its goals and purpose.

The first section contains overview small-scale maps of area mostly suffered from the Chernobyl NPP accident consequences. It coveres the European part of Russia, Belorussia and Ukrain.

The section begins with the maps at scale 1:10 000 000 presenting background contamination with nuclear tests products (took place in the late 1940s-the easly 1970s); terrain contamination with ^{137}Cs resulted from the Chernobyl NPP accident and gamma-dose rates from

this contamination. A set of maps on ^{137}Cs and ^{90}Sr occurance resulting from the Chernobyl accident is also presented on tne background of global fallout in this section (on scale 1:2 500 000).

The global consequence of the Chernobyl accident determining the radioactive situation on the whole territory of the East European Plain at present are shown in this section.

The second section contains maps on contamination of areas, directly adjacent to the Chernobyl NPP. The accident resulted in release of the long-lived radionucledes to the atmosphere; their fallout formed an anomaly with unique radionuclide composition in the adjoining zone of the Chernobyl NPP.

Both preliminary maps compiled directly after the accident, and maps of the later period compiled on the base of data of gamma-spectrometry and radio--chemical analysis of soil samples from the control network within the zone of 60 km radius around the Chernobyl NPP are presented in this section.

The maps of scales 1:500 000 show terrain contamination with radionuclides of different half-decay* periods (^{137}Cs, ^{90}Sr, $^{239+240}Pu$, ^{238}Pu, ^{241}Am, ^{134}Ce, ^{144}Ce, ^{106}Ru, ^{244}Cm).

The third section of the atlas contains maps of the subjects of Russian Federation, on which territories ^{137}Cs contamination spots with levels above 37 kBk/m^2 are fixed.

The territory of each district or republic is presented by maps at scale of 1:1 000 000 characterizing ^{137}Cs occurance of the Chernobyl origin (from the level of 3,7 kBk/m^2), and doze rate from the Chernobyl fallout (from the level of 1 mkR/h).

This section also contains maps (scale 1:500 000) on ^{137}Cs contamination spots with levels of 37 kBk/m^2 and above. This contamination level is adopted as a level at which privileges for population are valid (according to the law of Russian Federation "On social protection of citizens affected by radiation from the Chernobyl NPP accident"). The scale used enables to atribute each settlement to the zone corresponding to the status of certain social guarantees.

Besides this section contains summary table of contaminated areas by the subjects of the Russian Federation and administrative units of Ukrain and Belorussia.

The fourth section contains reference cartographic materials at scale of 1:10 000 000 covering the investigated area and giving a possibility to conduct primary ecological interpretation of the maps of the main thematic content of the atlas. These maps can be devided into two groups.

The first group includes political and administrative map, map on population density, as well as maps containing information on environmental and geochemical conditions influencing the radionuclides migration.

The second group contains maps characterizing natural radioactivity connected with content of uranium, thorium potassium and other elements in soils and rocks; external radiation caused by ionizing space radiation; chemical pollution of the environment which is the groundbase of the negative effects of the radioactive contamination.

This section also includes the description of the technics of measurements and map compilation; schemes on state of investigation by air-gamma-spectrum survey and soil sampling are shown.

The cartographic information of all the sections of atlas is accompanied by texts explaining and supplementing the content of the maps. A special attention is paid to dynamic characteristics, tendencies, forecasts, studing the causes and other information for which the text form is more preferable.