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Comprehensive environmental monitoring based on aerospace and ground research data

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SUMMARY

A new approach to the development of a method for complex assessment of the state of the environment caused by the growing level of anthropogenic load is proposed. Assessment of life risks is based on the results of forecasting the likely consequences of man-made and natural hazards.

Introduction. To solve the problems of integrated environmental monitoring of territories, researchers from different countries use data from remote sensing of the Earth from space, whose significant advantages over ground-based methods are high territorial coverage and the ability to repeatedly re-survey the territory (Baum et al., 2014). To solve the problems of monitoring territories, space survey data is used in the visible, near (Near Infrared, NIR), middle (Short-Wave Infrared, SWIR) and far (Thermal Infrared, TIR) and infrared ranges of the electromagnetic spectrum To sensors that collect data from thermal surveys of average spatial resolution, including ETM+ (Landsat-7 satellite, prz 60 m), ASTER (Terra satellite, PR 90 m), TIRS (satellite Landsat-8, prz 100 m), TM (Landsat-5 satellite, prz 120 m), bird (bird satellite, prz 370 m), prz 548 m), MODIS (Terra, Aqua satellites, Prz 1000 m), AVHRR (NOAA satellites, prz 1100 m), and other satellite Data are used for solving temperature mapping tasks: determining the temperature of the earth's surface; identifying and mapping industrial, agricultural, and forest fires; mapping vegetation cover, thermal observations ;monitoring active fires; climate changes in megacities, and others (Korchenko et al., 2019).

Method. Existing information technology thematic processing of space images can be divided into the following categories: information technology software development of image processing, web technology, data visualization, satellite imaging, information storage technologies, information technology thematic processing of space images.

Figure 1 *Satellite image from the Landsat 7 SPACECRAFT with a resolution of 30 m from 18.07.2018*

Operational satellite monitoring of the state of technogenic geo-systems – natural resource management, research of the dynamics of natural processes and phenomena, analysis of the causes of environmental pollution, forecasting of possible consequences and selection of ways to prevent emergency situations are an integral attribute of the methodology for collecting information about the state of the territory that is being studied (country, region, city) (Myrontsov, 2019a). This information is necessary for making correct and timely management decisions. To assess the dynamics of ecosystems in the Carpathian region in the conditions of technogenic dust pollution of the air, a GEODATA database was formed, which included satellite images from Landsat 7 spacecraft (Fig.1.); topographic maps, digital terrain models of various details (Myrontsov, 2019b).

Sulfurous anhydride in atmospheric air enters into chemical reactions with water and can already be shed with rain on the ground in the form of acids. Now, sulfur dioxide emissions are an acute problem and do not meet European standards (Okhariev and Trysnyuk, 2019). Carbon monoxide increases the greenhouse effect (Fig.2) (Trofimchuk, 2002).

Figure 2 *Nitrogen dioxide from the Burshtyn TPP causes smog.*

Solid particles from coal combustion (ash, coal dust) that were not caught by the gas cleaning equipment settle in a 30-kilometer radius around the station (Fig. 2) (Trofimchuk et al., 2018).

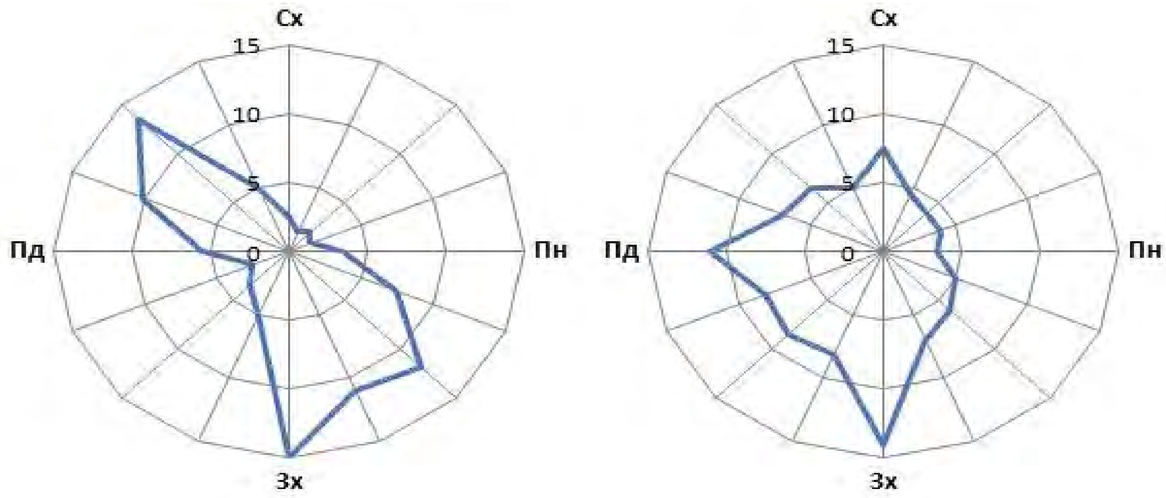

Figure 3 *The distribution of sulfur dioxide.*

For the Burshtyn TPP, the problem of storing and processing solid waste – fuel slag and ash – that remains after burning coal in the TPP furnaces is extremely urgent (Trofimchuk et al., 2017).

The results of monitoring made it necessary to establish the actual conditions for the formation and manifestations of environmental hazards of this subspecies, taking into account the sources of secondary dust pollution of the air (Trofimchuk et al., 2013a).

In order to establish the main characteristics of previously unrecorded sources of dust pollution, experimental studies were conducted in the laboratory and by field observations. The most significant factors affecting the quantitative indicators of the volume of dust intake from these sources of pollution are the dispersion of dust particles, wind speed, atmospheric humidity, precipitation (in the form of rain and sleet) (Trofimchuk et al., 2013b).

At wind speeds of 7-10 m / s, the time required to restore dust blowing from the surface of storage areas varies slightly and is about 3 hours (Trofimchuk et al., 2019a). At a relative humidity of 99%, the intensity of dust blowing is reduced by 25%, while the care humidity increases 16 times (from 0.11% to 1.69%) (Trofimchuk et al., 2019b).

Conclusions. The research process uses information about the types, ranges and time of surveys; data on landscape decoding features of the territory are collected; indicators of the geo-ecological state (geoindicators) are determined; automated treatment of multizonal image is performed; the development of exogenous geological processes is analyzed, and lineament zones are decoded (Trofimchuk et al., 2018). As a result, maps of the location of man-made objects and thematic maps based on space data are constructed; comparative analysis of situational remote images is performed; they get up-to-date information about changes in the state of the environment, and use mathematical tools, classifications, and modeling to assess the geo-ecological state (Trysnyuk, V et al., 2019).

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