

Multilevel System of Earth Operational Hyperspectral Monitoring

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The project on multilevel system of Earth operational hyperspectral monitoring is oriented towards development of regional system of operational hyperspectral monitoring of physicochemical conditions of natural and anthropogenic objects based on data obtained with hyperspectral sensors used in space, aviation and ground facilities in the interest of regional state authority and local government as well as in the interests of enterprises having different form of property to solve a wide range of socioeconomic and scientific tasks.

The system integrates world innovative achievements into the field of hyper- and multispectral observation equipment, space and aviation vehicles with hardware of the specified class, high-precision systems with global coordinate system, analytical methods of physicochemical compositional analysis and information technology to process hyperspectral images and contained data.

Multilevel system of Earth operational hyperspectral monitoring is composed of space monitoring system (Resurs-P developed by SRC Progress), plane-laboratory produced on the bases of light multipurpose airplane and/or unmanned spacecraft by SRC Progress, ground monitoring systems (system of stationary and mobile physical and chemical laboratories and monitoring systems developed by SSAU).

Current technical problems in highly-detailed hyperspectral equipment development and a lack of experience in usage of hyperspectral data to solve socio-economical and scientific tasks lead to development of three-level monitoring system. Space segment of the operational

hyperspectral monitoring system is expected to provide global observation with resolution of 30m. Aviation segment is meant to perform a survey in synchronous mode to validate hyperspectral data received from spacecraft during autonomous operation in order to obtain on-line hyperspectral data with high spatial resolution. Ground segment provides intake of soil samples and water and they are analyzed to form and constantly renew bases of standards "Spectral coefficient of surface reflection – chemical composition". Today such native bases of spectral data are absent.

Novelty of the project defines a lack of real operating experience of the hyperspectral equipment and usage of results of hyperspectral imagery to solve a wide range of tasks in the field of remote sensing in RF, while hyperspectral imagery is widely used abroad (similar systems are used only in the USA and dynamically developed in EU countries).

Novelty of the offered concept on data acquisition concerning natural and anthropogenic objects as well as recording of their changes is determined with:

- definition of some characteristics of the object in a great number of narrow spectral ranges;
- surface distribution of spectral characteristics in area extent;
- imaging of the object on the bases of spatial data and spectral characteristics integration which enables further to identify objects reliability, to define their characteristics and current condition;
- video data integration of the traditional remote sensing hardware having data measuring component presented as hyperspectral hardware.