the remote sensing data, algorithms and programs, as well as to pre-process results of the remote sensing in mm and IR ranges, and to apply purpose-oriented signal processors that can be incorporated into the observation system. Image processing methods based on the neural networks will be created [3].

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«Choven» Experiment

SCIENTIFIC HARDWARE AND METHODS FOR THE REMOTE MONITORING THE EARTH'S ATMOSPHERE AND SURFACE BY MILLIMETER WAVELENGTH RADIOMETRY

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Further progress of such important research fields as climatology, meteorology, and environmental monitoring largely depends on understanding the regularities of the origin and phase redistribution of atmospheric moisture.

Practically approved radiophysical methods of remote monitoring of the Earth's surface and atmospheric parameters have led to a marked improvement in the efficiency of global and regional monitoring.

At the same time, the problem of negative influence of atmospheric inhomogeneity in the cases of Earth's surface (especially of the ground) sounding, as well as negative influence of the Earth's landscape irregularities during atmosphere monitoring, has not been solved yet. At present, the satellite systems operating in the mm-wavelengths radiometric channels (Cosmos-1610, Nimbus, SSM/I, TRMM, and others) are used.

The proposed «Choven» experiment will deal with development of hardware and methods to conduct remote monitoring of the Earth's surface and atmosphere, as well as with development of new methods for data interpretation. The project pursues the following objectives:

— ensuring higher sensitivity and improving equipment configuration as compared with, e. g., the best US-Japanese counterpart satellite «TRMM», which provides the tropical zone monitoring;

— covering other latitudes with monitoring;

— obtaining information, which is currently lacking for implementation of the ideas earlier set forth by the authors with respect to development of new methods and approaches in processing the remote sounding data [1, 2].

The scientific novelty of the planned space research underlies the significance of this experiment. It is based on development of new methods and approaches capable of achieving higher accuracy in interpretation of the meteorological parameters and improved quality of the Earth's surface radio images in mm-range of wavelengths. With respect to the applied science, the novelty of the experiment lies in continuous generation of current information on water content in the atmosphere, as well as on the phase composition of cloudy moisture using the regular and new methods developed during performance of this research project. These data are necessary for obtaining new climatic, meteorological and general physics estimates.

Facility. The first stage of the experiment envisages the use of a five-band radiometric scanning system operating as a part of the measuring equipment

system of the Ukrainian Research Module onboard the ISS (boosted into a circular orbit at 350 km). The system will provide reception of thermal radiation in the ranges of 19 GHz, 22 GHz, 34 GHz, 55 GHz and 94 GHz in the two-polarization mode. The radiometers will operate with a common scanning antenna providing 800 km survey zone. The sensitivity of uncooled radiometers will be equal to 0.0150—0.030 K, and the space resolution of the antennas will be equal to 0.20°—0.90° (depending on the frequency range). The system power consumption will be 80 W, and its gross weight will be 50 kg.

The main results of the experiment will be as follows:

— development of a space-based measuring-computing complex and related software and methods, as well as evaluation of their reliability and performance, that will be important for fulfillment of some subsequent satellite (unmanned) projects;

— development of new data processing methods and obtaining new data for making climatic and meteorological estimates, as well as for acquiring general physical knowledge and development of new concepts;

— development of an access system for domestic and foreign users aimed at retrieving the primary and secondary data on remote monitoring of the Earth's atmosphere and surface;

— creation of an international network for subsatellite support and participation in new international research projects;

— definition of the subsequent problems and ways for their further solution to meet and develop the experiment's goals.

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