

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)

Astronauts: Those Who Make It Happen (5)

Author: Prof. Mikhail Yu. Belyaev
Korolev RSC Energia, Russian Federation

Dr. Lev Dessinov
Institute of Geography at Russian Academy of Sciences, Russian Federation

Mr. Dmitry Karavaev
Korolev RSC Energia, Russian Federation

SPECIFICS OF CONDUCTING AND USING IMAGERY OF THE EARTH'S SURFACE PERFORMED
BY THE RUSSIAN ISS CREW

Abstract

At present space survey is performed by automatic spacecraft. However, valuable information on objects on the Earth's surface is provided by imagery taken by cosmonauts on the International Space Station (ISS) under the "Uragan" (hurricane) program. Digital cameras Nikon D3, Nikon D3X with long-focus lens to enable a record of color images of objects in a visible range with up to 2-3 m resolution, as well as manually operated spectral hardware are used for imagery.

Earth view imagery from the ISS has some specifics as compared to survey by Earth remote sensing (ERS) satellites, among which it's worth to note capabilities of real-time intellectual response to events, real-time implemented nadir and perspective shooting capabilities, etc. In addition, inasmuch as the ISS orbit has a lower altitude as compared to sun-synchronous orbits of ERS satellites, this increases the resolution of images acquired by the ISS equipment.

One of the important objectives of the development test imagery from the Russian Segment (RS) of the ISS under "Uragan" program was an assessment of applicability of this data for practical use.

To ensure the earth's surface imagery by cosmonauts of the ISS, and use of the acquired images, special software for observations planning, picture reference and image processing was developed.

A simple conversion technology for space images received from the ISS RS by handheld cameras at different shooting angles was developed.

Space images acquired from the ISS RS are widely used by different organizations in their research and practical work. For 10 years of using space images as a type of information materials, it was made possible to utilize them in the following areas.

- Exogenetic processes: land slides, earth falls, avalanches, surges of glacier.
- Exogenetic processes: volcanic activity, earthquakes, etc.
- Threat of forest fires.
- Threat of dust storms.
- Climate prediction estimate.
- Geological mapping.
- Landscape changes in different areas.
- Dynamics of flooding, ice drift.
- Monitoring of pollution areas around the power industry infrastructure and the water surface, etc.

The paper addresses specifics of imagery taken by the ISS RS cosmonauts, describes the software developed for observations planning, images processing and analysis. Listed are the main "Uragan" experiment results. The analysis of causes and consequences of floods in Krymsk in 2012 based on the ISS RS images is given as an example.