

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Utilization & Exploitation of Human Spaceflight Systems (3)

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STUDY OF CATASTROPHIC PHENOMENA AND ENVIRONMENTAL PROBLEMS FROM THE
RUSSIAN SEGMENT OF THE ISS

Abstract

The space experiment (SE) *Uragan* onboard the International Space Station (ISS) Russian Segment (RS) is aimed at addressing the following scientific and applied tasks:

- Observation and study of evolving catastrophic phenomena and environmental problems from the ISS RS;
- Developing math models of catastrophic phenomena propagation;
- Developing equipment and methods for studying Earth surface from the ISS RS to be subsequently onboard unmanned spacecraft;
- and etc.

The following equipment is currently used in the SE *Uragan*: digital still cameras, photospectral system, videospectral system.

The paper presents major results obtained in the course of the SE *Uragan*, which include:

- Developing procedures for the ISS RS crew to obtain real-time data on the catastrophic phenomena;
- Use of the obtained data in the development of math models for the propagation of catastrophic phenomena on the Earth surface;
- Processing a large amount of unique images relating to various areas of research.

One of the objectives of the SE *Uragan* is to construct propagation models for the catastrophic phenomena under study. Propagation dynamics for a number of catastrophic phenomena can be determined using an estimation of the variations in the surface area of the phenomena under observation: floods, fires, spills, etc. One of the sites remaining under permanent observation in the SE *Uragan* is Aral Sea, variations in the water surface area of which demonstrate the propagation dynamics of this environmental disaster.

In order to determine surface areas of the sites studied in the SE *Uragan* with the use of hand-held cameras, special procedures and software were developed.

During the implementation of the *Uragan* space program from the ISS RS there is periodically shooting a few tens of pulsating and dynamically unstable glaciers.

For an operational definition of the speed of a glacier, photographed from the spacecraft, there have been developed special techniques to improve the accuracy of measurements:

- method of calculating the movement of points on the surface of the dynamically unstable glacier with respect to the reference alignment;
- method of calculating the movement of the dynamically unstable glacier based on a change of the lowest point position of his tongue with respect to the reference alignment.

The report presents the results of the study of the catastrophic phenomena propagation using the developed procedures and software, as well as methods for conducting observations by the crews of the ISS RS.