

The satellite monitoring and forecasting of volcanic clouds distribution

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Volcanic activity is the cause not only of disruption of air traffic but also of significant short-term climate changes. Powerful volcanic eruptions, as a rule, throw a lot of gas and volcanic ash into the atmosphere, forming an aerosol layer that can remain in the atmosphere for several years, changing the intensity of solar radiation. The height of the ejection of the volcanic cloud, its composition, particle size and ash mass determine the degree of eruption hazard. Satellite data makes it possible to visualize the ash plume, as well as to determine its main parameters and to predict the spread of volcanic ash in the atmosphere.

Specialists of the State Research Center for Space Hydrometeorology «Planeta» have developed an original algorithm for determining the parameters of volcanic ash, which makes it possible to reconstruct such parameters as the effective radius of ash particles, its optical thickness, and concentration from satellite data. Model dependencies obtained for a wide range of conditions that take into account the variety of observing geometry, the variability of the optical regime of the atmosphere, the composition of volcanic ash, is used to calculate the mass characteristics of ash.

The algorithm predicts the distribution of volcanic ash in the atmosphere using modern FlexPart model. The input parameters for modeling are mainly data on the time of the eruption, the coordinates of the eruption sources, the physical properties of the substance being erupted, the estimated height of the outburst and the forecast of the wind parameters at different altitudes. Predicting the displacement of volcanic ash gives accurate results in the first 6-24 hours after the eruption.