Contribution ID: **28** Type: **Overview**

Solar energetic particles and trapped radiation in the near-Earth's Space: space experiments and modelling

Tuesday, 8 June 2021 16:10 (25 minutes)

Among the factors of space weather, one of the most dangerous phenomena is radiation. Radiation in space exists due to the presence of charged particles of different nature and creates problems for the "vitality" of not only the spacecraft, but also of humans. The main radiation threats are solar and galactic cosmic rays, fluxes of precipitating magnetospheric particles and trapped particles of the Earth's radiation belts. Solar and geomagnetic activity, which determine space weather, can cause drastic changes in physical conditions in geospace, which affect technological systems located both in space and in polar regions on the surface of the Earth. To prevent emergencies associated with cosmic factors, it is necessary to constantly monitor the solar activity and the state of the space environment.

Experimental studies and operational monitoring of trapped radiation and cosmic rays have been conducted by MSU' Institute of Nuclear Physics since the beginning of the space age. The Institute has accumulated extensive experience in creating instrumentation for measuring ionizing radiation from spacecraft. On the basis of the experiments carried out, modern models of the space environment have been created, on the basis of which several national and international standards have been developed. Satellite measurement data and models of the space environment are the basis for continuous monitoring of radiation conditions in space. Space Monitoring Data Center has been established at SINP MSU for analysis and forecasting of the space environment radiation state.

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Session Classification: Cosmo- and geophysical aspects of cosmic rays

Track Classification: Cosmo- and geophysical aspects of cosmic rays