Space weather disturbances by cosmic ray intensity and their connection with satellite malfunctions

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For prediction of space weather it is very important to know the level and variations of galactic cosmic rays (GCR) and possible additional flux of solar cosmic rays observed at the Earth by means of neutron monitors. The Alma-Ata high altitude neutron monitor has a favourable location and very good statistics (~1200 counts per second) to detect different cosmic ray effects conditioned by the space weather. The combination of geomagnetic cut-off rigidity (6.7 GV) and high altitude (3340 m above sea level) makes our station enable to record ground level enhancements (GLE) for the events where maximal rigidity of the protons exceeds 6.7 GV. In order to analyze interplanetary and geo-space situation during of dangerous periods of space environment we use real-time observations of cosmic ray intensity in 1-minute regime of accumulation. Besides that we calculate hour cosmic ray activity indices in real time. These indices behave similar to the geomagnetic activity indices but they respond to the proton enhancements also. Using complex database of malfunction events we can see that series of satellites malfunctions may be appeared during periods of high geomagnetic activity and solar proton events. These periods are characterized using cosmic ray activity indices very good. Observations of energetic particles and of galactic cosmic ray variations in real time recorded by Alma-Ata neutron monitor may also be applied to forecasting purposes.

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