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Method for detecting sporadic manifestations of solar activity in cosmic ray variations

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The report examines the results of the detection of sporadic changes in variations of galactic cosmic rays observed on the eve of and during periods of magnetic storms of different physical nature. The theoretical basis of the research was the method developed by the authors for analyzing variations in the intensity of cosmic rays based on measurements from neutron monitor stations. The method is based on a combination of classical statistical methods with modern approaches, including elements of machine learning and data decomposition methods [1], [2]. The work analyzed periods of weak and moderate magnetic storms in 2017-2023. A network of polar and high-latitude ground-based neutron monitor stations was used (www.nmdb.eu). The report will present the basics of the method, algorithms for its implementation, and show the results of the method both in real time and in a posteriori analysis.

Based on the results of the study, the effectiveness of the method for the task of detecting anomalous changes in variations of cosmic rays of various amplitudes and durations was confirmed. The detected anomalous changes were of a general nature at all stations both before and during the analyzed magnetic storms. This confirms the importance of taking galactic cosmic rays into account in space weather problems.

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References

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