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Criteria for early detection of geomagnetic disturbances caused by coronal holes during periods of low solar activity based on muon flux variations

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Coronal holes generate a high speed solar wind. This wind is the cause of magnetic storms on the Earth during the years of low solar activity. Also a high speed solar wind creates disturbances in the interplanetary magnetic field. The disturbance may reflect cosmic rays hitting it in the direction of the Earth. As a result, it is possible to observe an increase in the flux of cosmic rays on the Earth before the arrival of the disturbance. The paper identifies a criterion for early detection of the response of the muon hodoscope URAGAN (MEPhI, Moscow) to coronal holes in years of decreased solar activity (2009-2010, 2018-2019). It was found that the region of increased cosmic ray intensity is visible before the main sequence of regions of increasing and decreasing cosmic ray intensities in GSE maps in 60% of the cases. In future, this will be used as one of the criteria for predicting magnetic storms.

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