



Solar causes of strong geomagnetic disturbances during the period 1996—2013

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The purpose of this research is to assess the contribution of CMEs and CIRs to geomagnetic activity during the period 1996—2013, covering the 23rd solar cycle, the solar minimum between the 23rd and the 24th solar cycles as well as the ascending part of the current 24th solar cycle. Both CMEs and CIRs are capable of driving significant space weather effects on the Earth. Current study is not primarily aimed at construction of prediction models but can contribute to this topic by answering two principal questions: (1) what is the contribution of CME and CIR type solar events to various levels of geomagnetic disturbances and how it varies during the solar cycle (2) how does the successive emergence of CME and CIR events influence the geomagnetic response. Sometimes it can be difficult to assign the response to a particular event properly, especially in the case of several successive events. We noticed that the CIRs appeared to play important role also in years when strongly geoeffective CMEs occurred. An interesting finding, which we have revealed on this subject, concerned the year 2009; then the extremely low geomagnetic activity was probably caused by very slow solar wind from coronal holes along with the rare occurrences of CIRs.