[SE-07] Prospects of empirical space weather forecast based on solar information

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In this talk I will review our recent progress of space weather forecast based on solar information. Major findings can be summarized as follows. First, we presented a concept of storm probability map depending on CME parameters. Second, we suggested a CME earthward direction parameter and demonstrated its importance in terms of the forecast of geomagnetic storms. Third, the importance of solar magnetic field orientation for storm occurrence in terms of ICME classification was examined. Fourth, the relationship among coronal hole-CIR-storm relationship has been investigated, Fifth, the storm forecast based on coronal hole information is in progress but challenging. Sixth, a new proton event forecast method including helio-longitudinal dependence has been suggested. We are attempting to apply machine learning technology to space weather forecast. I will discuss the importance of these works and their future prospects.

[SE-08] Forecast of Geomagnetic Storm based on CME and Interplanetary Condition

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In our previous studies, we already examined the CME properties that control the CME geoeffectiveness and suggested the geomagnetic storm prediction formula based on only initially-observed CME parameters. However, there are some limitations for the forecast using only CME parameters, since geomagnetic storms are directly affected not only by solar source events but also by near Earth interplanetary conditions. In addition to this, the initially-observed CME characteristics can be changed during its transit to the Earth. For this reason, we have to consider real time solar and interplanetary conditions together to improve the forecast capability of geomagnetic storms. In this study, we examine near Earth interplanetary conditions for 64 CME-Dst pairs from 1997 to 2003, which were associated with M and X class solar flares and whose source regions were clearly identified. We ensure that the peak Bz and Ey prior to Dst minimum value are strongly related with Dst index. By carefully investigating the interplanetary condition for moderate geomagnetic storms (Dst $\leq$ 50 nT), we suggest an empirical criteria: Bz = -5 nT or Ey = 3 mV/m for t = 2 hr. As a result, most of the storms (90 %) satisfy the interplanetary criteria. Among 20 exceptional eventsunsatisfying the CME-storm forecast, 15 misses can be explained by the interplanetary condition, but we couldn't find the cause of 5 false alarms. By considering both conditions, all geomagnetic storms (Dst $\leq$ 50 nT) are found to occur when the CME conditions or interplanetary conditions (Bz $\leq$ -5 nT or Ey $\geq$ 3 mV/m for t $\geq$ 2 h) are satisfied.