

[초IT-03] How to forecast solar flares, solar proton events, and geomagnetic storms

Yong Jae Moon

School of Space Research, Kyunghee University

We are developing empirical space weather (solar flare, solar proton event, and geomagnetic storm) forecast models based on solar data. In this talk we will review our main results and recent progress. First, we have examined solar flare (R) occurrence probability depending on sunspot McIntosh classification, its area, and its area change. We find that sunspot area and its increase (a proxy of flux emergence) greatly enhance solar flare occurrence rates for several sunspot classes. Second, a solar proton event (S) forecast model depending on flare parameters (flare strength, duration, and longitude) as well as CME parameters (speed and angular width) has been developed. We find that solar proton event probability strongly depends on these parameters and CME speed is well correlated with solar proton flux for disk events. Third, we have developed an empirical storm (G) forecast model to predict probability and strength of a storm using halo CME - Dst storm data. For this we use storm probability maps depending on CME parameters such as speed, location, and earthward direction. We are also looking for geoeffective CME parameters such as cone model parameters and magnetic field orientation. We find that all superstorms (less than -200 nT) occurred in the western hemisphere with southward field orientations. We have a plan to set up a storm forecast method with a three-stage approach, which will make a prediction within four hours after the solar coronagraph data become available. We expect that this study will enable us to forecast the onset and strength of a geomagnetic storm a few days in advance using only CME parameters and the WSA-ENLIL model. Finally, we discuss several ongoing works for space weather applications.