made a model by training 348 front-side halo CMEs from 1997 to 2001, and predicted geo-effectiveness of 140 CMEs from 2001 to 2003. Finally we could achieve 72.1% accuracy in prediction by using SVM. In the future, we will apply machine learning technology to various space weather predictions to achieve more accurate predictions.

[SE-10] Statistical comparison of interplanetary conditions causing intense geomagnetic storms

Eun-Young Ji, Yong-Jae Moon, Dong-Hun Lee
Department of Astronomy and Space science, Kyunghee University

The southward IMF Bz field and convective electric field Ey component are well known interplanetary parameters which control the occurrence of intense geomagnetic storms (Dst ≤ -100 nT). In this study we have made a statistical comparison of interplanetary conditions of these parameters causing intense geomagnetic storms. By investigating the conditions of 82 intense geomagnetic storms from 1998 to 2006, we considered 8 different criteria of interplanetary conditions for the occurrence of gemagnetic storms including what Gonzalez and Tsurutani (1987) suggested - Bz < -10 nT or Ey > 5 mV/m for interval > 3h. Then we applied these criteria to whole interplanetary data during the same period. As a result, we present contingency tables between prediction and observation, and obtain their statistical parameters for forecast evaluation such as probability of detection yes (PODy), false alarm ratio (FAR), Bias and critical success index (CSI). A comparison of these statistical parameters for 8 criteria shows that the best criteria for intense geomagnetic storms is Bz ≤ -8 nT or Ey ≥ 5 mV/m for 2h. In this case, the PODy, FAR, Bias and CSI are estimated to be 0.85 0.41 1.45 0.53, respectively.

[SE-11] Empirical forecast of corotating interacting regions based on coronal hole information

Ji-Hye Lee[1], Yong-Jae Moon[2], Kye-Hwa Yoo[1]
[1]Department of Science Education, Ewha Womans University, [2]Department of Astronomy and Space Science, Kyung Hee University

In this study, we suggest an empirical forecast of CIRs (Corotating interaction regions) based on the information of coronal holes (CHs). For this we used CH data obtained from He I 10830 Å maps at National Solar Observatory-Kitt Peak from 1996 to 2003 and the CIR data that Choi et al. (2009) identified. Considering the relationship among coronal holes, CIRs, and geomagnetic storms (Choi et al. 2009). we propose the criteria for geoeffective coronal holes ; the center of CH is located between N30 and S30 and between E40 and W20, and its area in percentage of solar hemispheric area is larger than the following areas: (1) case 1 : 0.36%, (2) case 2 : 0.66%, (3) case 3 : 0.36 % for 1996-2000, and 0.66 % for 2001-2003. Then we present contingency tables for three cases and their dependence on solar cycle phase. From the contingency tables, we determined several statistical parameters for forecast evaluation such as PODy (the probability of detection yes) , FAR (the false alarm ratio), Bias (the ratio of "yes" predictions to "yes" observations) and CSI (critical success index). Considering the importance of PODy and CSI, we found that the best criterion is case 3 ; PODy=0.78, FAR=0.66, Bias=2.26, and CSI=0.31. It is also found that the parameters near solar minimum are much better than those near solar maximum. As a next step, we are developing a forecast method of geomagnetic storms based on coronal hole information.

[SE-12] Source identification of back side solar proton events

Jinhye Park, Yong-Jae Moon and Dong-Hun Lee
Department of Astronomy and Space science, Kyunghee University

Solar proton events, whose fluxes are larger than 10 particles cm-2 sec-1 ster-1 for >10 MeV protons, have been oserved since 1976. NOAA proton event list from 1997 to 2006 shows that most of the events are related to both flares and CMEs but a few fraction of events (5/93) are only related with CMEs. In this study, we carefully identified the sources of these events. For this, we used LASCO CME catalog and SOHO MDI data. First, we examined the property of CMEs related with the events. The CMEs are found to eject from the western hemisphere and their velocities are all above 1200Km/s. Second, we searched a major active region in the front solar disk for several days before the proton events occurred by taking into account two facts : (1) The location of the active region is consistent with the position angle of a given CME and (2) there were several flares in the active region or the active region is the largest among several candidates. As a result, we were able to determine active regions which are likely to produce proton events without ambiguity as well as their longitudes at the time of proton events by considering solar rotation rate, 13.2° per day. From this study, we found that the longitudes of five active regions are all between 90°W and 120°W. When the flare peak time is assume to be the CME event time, we confirmed that the dependence of their rise times (proton peak time - flare peak time) on longitude are consistent with the previous empirical formula. These