[구SE-17] Identification of backside solar proton events

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Solar proton events, whose fluxes are larger than 10 particles cm-2 sec-1 ster-1 for >10 MeV protons, have been observed 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 directions of CMEs related with the events and the CMEs are found to eject from the western hemisphere. 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 results imply that five events should be also associated with flares which were not observed because they occurred from back-side.

[포SE-18] Relationship of ground level enhancements with solar erupted factors

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Cosmic rays registered by Neutron Monitors on the surface of the Earth are believed to be coming from outer space, and sometimes also from the exotic objects of the Sun. Ground level enhancement (GLE) is the sudden, sharp and short-lived increase in cosmic rays originated from the Sun. Since GLE is the signature in solar cosmic ray intensity, different solar factors erupted from the Sun can be responsible for causing it. In this context, an attempt has been made to determine quantitative relationships of GLEs > 5% with simultaneous solar, interplanetary and geophysical factors from 1997 through 2006 thereby searching the perpetrators which seem to be causing them. The study has revealed that solar flares are stronger (0.71 x 10-4 w/m2) during GLE peaks than the solar flares (1.10 x 10-5 w/m2) during GLE non-peaks and backgrounds. On the average, the solar wind plasma velocity and interplanetary magnetic field are found stronger during the GLE peaks than the GLE non-peaks and backgrounds indicating that the solar flares, in conjunction with interplanetary shocks, sometimes may cause GLE peaks. Direct proportionality of GLE peaks to simultaneous solar energetic particle (SEP) fluxes imply that the GLE peaks may often be caused by SEP fluxes. Although the high intensity of SEP fluxes are also seen extended few minutes even after GLE peaks, the mean (373.62 MeV) of the GLE associated SEP fluxes is much stronger than the mean (10.35 MeV) of the non-GLE associated SEP fluxes. Evidences are also supported by corresponding SEP fluences that the the mean fluence (~ 5.32 x 107/cm2) across GLE event was more intense than the mean fluence (~ 2.53 x106 /cm2) of SEP fluxes across non-GLE event.