[구SO-09] Relationship between CME and Solar Proton Events over the solar cycle 23

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A study of solar proton events(SPEs) with well-identified sources has been carried out using data from GOES satellites. We used the SPEs based on the NOAA definition with a threshold of > 10 pfu at 10 MeV proton energy channel. The 62 SPEs were identified over the solar cycle 23, from 1997 to 2006. We found some good correlations between (1) CME direction parameter and SPE peak intensity, and (2) CME direction parameter and delay time from CME to SPEs. We tested the role of Interplanetary corona mass ejections (ICMEs) to accelerate energetic particles and flare longitude dependence of SPE time profiles.

[구SO-10] Prediction of solar proton event occurrence probability and its peak flux using its associated X-ray flux, impulsive time, and longitude

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Solar proton events have been regarded to be very important in that they may cause the damage of spacecrafts and human activities. In this study, we examined the longitudinal dependence of solar proton events and their relationships with x-ray flares. For this we used NOAA proton events whose fluxes of >10 MeV protons are greater than 10 particles cm-2 sec-1 ster-1 from 1976 to 2006, and their associated X-ray flare data. As a result, we found 181 proton events, of which most of them (169/181) are associated with major flares (85 X-class and 84 M-class). Then we examined the fraction of proton events relative to total major X-ray flares and its longitudinal dependence. We found that about only 3.6 %(2.0% for M-class and 20.7% for X-class) of the flares are associated with the proton events. We found that this fraction strongly depends on helio-longitude; for example, the fraction for 30W<L<90W is about three times larger than that for 30E<L<90E. We also note that the occurrence of SEP for flares with long duration (≥ 0.3 hour) is 2(X-class flare) to 6(M-class flare) times larger than that for flare with short duration (< 0.3 hour). In addition, the relationship between X-ray peak flux and proton flux as well as its correlation coefficient are strongly dependent on location, for example the correlation (0.8) for 30E<L<90E is much larger than that (0.03) for 30W<L<90W. Finally, we suggest a two-step proton event prediction model: (1) solar proton occurrence probability prediction according to the contingency tables depending on its associated flare strength, impulsive time, and longitude, (2) solar proton peak flux prediction as a function of the three parameters.