The Effects of Solar Wind Conditions on Relativistic Electron Fluxes at Geosynchronous Orbit.

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We have investigated the relationship between solar wind conditions and relativistic electron fluxes detected at geosynchronous orbit (GEO) using data from the GOES and ACE satellites. The flux level of relativistic electrons at GEO is found to be highly correlated with solar wind activity, exhibiting lower flux levels for more active solar wind conditions. On average, the log of the electron flux shows a roughly linear variation with solar wind parameters, such as the solar wind density, the magnitude of the interplanetary magnetic field. This result may indicate that the GEO relativistic electron fluxes depend in a very sensitive way on solar wind conditions and hence on the corresponding magnetospheric field disturbances. It has been also found that relativistic electron events--times of prolonged high electron fluxes--are invariably accompanied by extremely low solar wind pressure and interplanetary magnetic field. Some internal acceleration mechanisms may generate large fluxes of relativistic electrons near geosynchronous orbit, however those fluxes cannot reach high levels unless the solar wind continues to be extremely quiet for a few days. The results of this study suggest that, in the aspects of prediction of relativistic electron events, the behavior of the solar wind can be as important as understanding the electron acceleration mechanism(s).