

Space weather disturbances in the solar wind-magnetosphere-ionosphere coupled system

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The solar surface disturbances cause auroral substorms, geomagnetic storms and ionospheric storms. The solar X-ray enhancement causes sudden ionospheric disturbances (SID) responsible for blackout of the HF communication. The enhancement in the solar wind dynamic pressure, southward IMF and large amplitude Alfvén waves activate dynamos supplying electromagnetic energy to the magnetosphere and ionosphere. The electric field and currents are transmitted from the dynamos to the polar ionosphere along the magnetic field lines and then to the global ionosphere to cause magnetic field disturbances, geomagnetically induced currents (GIC), enhancement in the total electron content (TEC) and ionospheric irregularities. The TEC enhancement causes errors in GPS positioning system and the ionospheric irregularities cause scintillations in the radio signals from the satellite to the ground. The electric field drives the ring current in the inner magnetosphere, which causes geomagnetic storms on the ground. The electric field accumulates plasma in the near-Earth plasmashet, of which energy is released as the auroral substorm. During major storms, aurora appears at low latitude as in Hokkaido on October 21, 1989, and severe GIC effects cause power outage like in Canada on March 13, 1989. In my talk, I will discuss the space weather disturbances responsible for the anomalies on the satellites and ground facilities and mention the generation and transmission mechanisms of the electromagnetic energy in the magnetosphere and ionosphere.