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SOLAR WIND INTERACTION WITH EARTH'S MAGNETOSPHERE AND NEAR EARTH ORBITAL OBJECTS

Abstract

Satellites have become an integral part of mankind from the past 4 decades. We rely more on the satellites than any other system which the mankind has ever built. The satellites are subjected to radiation doses from the Sun, Earth's magnetic field and cosmic rays. One of the factors that play a major role in damaging the satellites is the strong radiations from the sun during a massive solar event such as a coronal mass ejection. A coronal mass ejection is a massive outburst of solar plasma and magnetic field from the sun. They travel at very high supersonic speeds with a very high magnetic field strength. These CME's when hit the Earth, compress the magnetosphere of the Earth from the dayside and causes the phenomena of aurorae. The satellites that are beyond the Van Allen Radiation Belts that is the communication satellites are affected the most. During a strong CME, a huge number of plasma particles would bombard the satellite along with a strong magnetic field, which would eventually result in the failure of the electronic equipment on board. The plasma is basically a Magnetohydrodynamic fluid. The physics of plasma depends on the MHD equations. This paper provides with the case study of the effect of a massive solar event on a geostationary satellite. The paper would provide with some analytical results of the compression of magnetosphere of Earth, the effect of the plasma on the metallic components on board the satellite and the effect of the magnetic field on the electronic components. Communication satellites are the most expensive satellites to launch as they have to be placed in the geostationary/geosynchronous orbits. If they are subjected to such high doses of radiation, then the money which is invested in building and launching them would be wasted. To avoid such scenarios, proper protective methods must be employed to safeguard the electronic components on board. Hence, the paper will analyse the protective measures that are used on the satellite, provide with some new protective measurements and compare both the results. The research presented in this paper would further lead to promotion of innovation necessary for protective measures of satellites.