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Poster

The solar wind and the interplanetary magnetic field perturb significantly the Earth magnetosphere. The aim of the study is to analyze the response of the Earth magnetosphere for various space weather conditions and model the effect of interplanetary coronal mass ejections. The magnetopause stand off distance, open-closed field lines boundary and plasma flows towards the planet surface are investigated. We use the MHD code PLUTO in spherical coordinates to perform a parametric study regarding the dynamic pressure and temperature of the solar wind as well as the interplanetary magnetic field intensity and orientation. The range of the parameters analyzed extends from regular to extreme space weather conditions consistent with coronal mass ejections at the Earth orbit. The direct precipitation of the solar wind on the Earth day side at equatorial latitudes is extremely unlikely even during super coronal mass ejections. For example, the SW precipitation towards the Earth surface for a IMF purely oriented in the Southward direction requires a IMF intensity around 1000 nT and the SW dynamic pressure above 350 nPa, space weather conditions well above super-ICMEs. The analysis is extended to previous stages of the solar evolution considering the rotation tracks from Carolan (2019). The simulations performed indicate an efficient shielding of the Earth surface 1100 Myr after the Sun enters in the main sequence. On the other hand, for early evolution phases along the Sun main sequence once the Sun rotation rate was at least 5 times faster (< 440 Myr), the Earth surface was directly exposed to the solar wind during coronal mass ejections (assuming today's Earth magnetic field). Regarding the satellites orbiting the Earth, Southward and Ecliptic IMF orientations are particularly adverse for Geosynchronous satellites, partially exposed to the SW if the SW dynamic pressure is 8-14 nPa and the IMF intensity 10 nT. On the other hand, Medium orbit satellites at 20000 km are directly exposed to the SW during Common ICME if the IMF orientation is Southward and during Strong ICME if the IMF orientation is Earth-Sun or Ecliptic. The same way, Medium orbit satellites at 10000 km are directly exposed to the SW if a Super ICME with Southward IMF orientation impacts the Earth.

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