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Bridging space weather to planetary systems

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Any variability related to the energy release from the Sun, in form of photon flux, solar wind streams, coronal mass ejections, and solar energetic particle events has been known to be the principal agent determining space weather at Earth. Space weather phenomena within a giant planetary system, e.g. the Jovian or the Saturnian systems, can be both of solar and internal (e.g. volcanism, plumes plus fast planetary rotation) origin.
The study of either circum-terrestrial or planetary space weather (referred to also as heliospheric space weather) considers different cross-disciplinary topics, such as the interaction of solar wind and of magnetospheric plasmas with planetary and satellite surfaces, atmospheres, and ionospheres; the variability of the planetary magnetospheres under different external conditions (solar or non-solar driven); the interactions of planetary radiation belts with atmospheres, satellites and rings. Understanding the interactions of planetary bodies with plasma and solar photon radiation helps to obtain a more in-depth understanding of the circum-terrestrial space weather phenomena.
In this paper, we review the scientific aspects of solar and non-solar driven space weather, at different regions of the Heliosphere, with special emphasis to the outer solar system. Through an interdisciplinary analysis of the existing results based both on observational data and theoretical models, we discuss the physics of the interactions between the environment of a Solar System body and the impinging plasma/radiation, with a direct reference to the circum-terrestrial case, when possible.