PLASMON: Data Assimilation of the Earth's Plasmasphere

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Abstract

The principal source and loss mechanisms in the Earth's radiation belts are currently not completely understood. Loss rates are important since they determine the duration of exposure of satellites to enhanced radiation conditions during a geomagnetic storm. The dominant loss process is relativistic electron precipitation via resonant interactions with a variety of wave modes. These interactions are governed by the characteristics of the plasmasphere. Current models provide an inadequate representation of the spatial and temporal evolution of the plasmasphere. In situ measurements of the plasmasphere provide only local characteristics and are thus unable to yield a complete global picture. Ground based measurements, based on the analysis of Very Low Frequency (VLF) whistlers and Field Line Resonances (FLRs), are able to describe large sections of the plasmasphere, extending over significant radial distances and many hours of local time. These measurements provide electron number and plasma mass densities.

PLASMON is a funded FP7 project between 11 international partners. PLASMON intends to assimilate near real time measurements of plasmaspheric densities into a dynamic plasmasphere model. The VLF whistler analyses will be conducted by automatic retrieval of equatorial electron densities using data from AWDAnet. Equatorial mass densities will be constructed from FLR measurements along meridional magnetometer chains. The resulting model will facilitate the prediction of precipitation rates. The predicted rates will be compared to observations from the AARDDVARK network.

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