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Representation of planetary magnetospheric environment with the paraboloid model

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Abstract

Paraboloid model of the Earth's magnetosphere has been developed at Moscow State University to represent correctly the electrodynamics processes in the near-Earth's space [1]. This model is intended to calculate the magnetic field generated by a variety of current systems located on the boundaries and within the boundaries of the Earth's magnetosphere under a wide range of environmental conditions, quiet and disturbed, affected by Solar-Terrestrial interactions simulated by Solar activity such as Solar Flares and related phenomena which induce terrestrial magnetic disturbances such as Magnetic Storms. The model depends on a small set of physical input parameters, which characterize the intensity of large-scale magnetospheric current systems and their location. Among these parameters are a geomagnetic dipole tilt angle, distance to the subsolar point of the magnetosphere, etc. The input parameters depend on real- or quasi-real- time Empirical Data that include solar wind and IMF data as well as geomagnetic indices. A generalized paraboloid model was implemented to represent the magnetospheres of some magnetized planets, e.g. Saturn [2], Jupiter [3], Mercury [4]. Interactive models of the Earth's, Kronian and Mercury's magnetospheres, which take into account specific features of the modeled objects have been realized at Space Monitoring Data Center of SINP MSU [5]. The real-time model of the Earth's magnetosphere is currently working at SINP MSU Space Weather Web-site [6]. Data from different sources (satellite measurements, simulation data bases and online services) are accumulated inside a digital framework developed within the FP7 project IMPEx. Paraboloid model of the magnetospheres (PMM) is part of this infrastructure. A set of Web-services to provide the access to PMM calculations and to enable the modeling data post-processing under SOAP protocol have been created. These will be implemented for easy data exchange within IMPEx infrastructure.

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