Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM27-05 会場:106 時間:5 月 21 日 10:00-10:15

太陽全球磁場観測に基づく全自動宇宙天気モデルの開発
Development of automatic daily MHD simulation system of inner heliosphere

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Interplanetary magnetic field (IMF) plays an essential role for energetic particle transport. Global IMF in the heliosphere is originated from open coronal magnetic field and dragged by solar wind. Coronal mass ejections (CMEs) changes IMF as they propagate in the inner heliosphere in addition to generating energetic particles. Therefore realistic modeling of solar wind and CMEs is an essential part of energetic particle modeling.

We recently have developed 3 dimensional global MHD simulation system of inner heliosphere. The simulation is based on minimal input, daily synoptic map of photospheric magnetic field. As a first step, we calculate coronal magnetic field with potential field source surface model and obtain maps of open magnetic field and expansion factor. Applying empirical models (such as Wang-Sheeley-Arge model), we obtain solar wind synoptic map. Using time series of the solar wind maps as the inner boundary(25 solar radii), we perform the global MHD simulation in 2 AU. MHD parameters at the Earth position are passed to a radiation belt model. These programs are executed everyday on a server in STEL, Nagoya university. We have been developing additional module to inject CMEs containing magnetic flux ropes.

キーワード: 宇宙天気, 太陽風, 磁場, 光球
Keywords: space weather, solar wind, magnetic field, photosphere