Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

PEM05-38 会場:303 時間:5 月 21 日 17:45-18:00

太陽観測データに基づいた内部太陽圏太陽風・CME の全自動宇宙天気モデルの開発
Development of automatic daily MHD simulation of solar wind and coronal mass ejections in inner heliosphere

塩田 大幸 [1*], 片岡 龍峰 [2], 三好 由純 [3], 垰 千尋 [4]
Daikou Shiota[1*], Ryuho Kataoka[2], Yoshizumi Miyoshi[3], Chihiro Tao[4]

[1] 理化学研究所, [2] 東京工業大学, [3] 名古屋大学太陽地球環境研究所, [4]Laboratoire de Physique des Plasmas, Ecole Polytechnique
[1]RIKEN, [2]Tokyo Institute of Technology, [3]STEL, Nagoya University, [4]Laboratoire de Physique des Plasmas, Ecole Polytechnique

MHD modeling of the solar wind and coronal mass ejections (CMEs) is important to understand the solar-terrestrial environment and to establish space weather forecast because they are the main sources of space weather disturbances. In addition, three-dimensional interplanetary magnetic fields formed by solar wind and CMEs affect the transport of solar energetic particles, and therefore a realistic modeling of the inner heliosphere is required also for the purpose of prediction of solar energetic particles (SEPs) [Kataoka et al., JpGU2013; Sato et al., JpGU2013; Kubo et al., JpGU2013].

We have developed a three-dimensional global MHD simulation of the inner heliosphere. We use daily updated synoptic map of the photospheric magnetic field as a minimal input. 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. The time series of MHD parameters at the Earth position are passed to a radiation belt model [Miyoshi et al. 2004] for forecasting of radiation belt electron flux. These programs are executed everyday on a server in STEL, Nagoya University.

The solar wind as background for propagation of CMEs is prepared in this way. We also report the method to automatically detect flares from observations and to inject associated CMEs, which contains magnetic flux ropes, into the inner boundary of the global MHD simulation. We will introduce modelling results of several CME events associated with high SEP proton flux and discuss the validation of our model and the further developments.

キーワード: 宇宙天気, 太陽風, 磁場, コロナ質量放出, 太陽光エネルギー粒子
Keywords: space weather, solar wind, magnetic field, coronal mass ejection, solar energetic particle