Trial release of Geospace Reanalysis Data by REPPU

Introduction

The Geospace phenomena like magnetic storms, substorms, and other global disturbances are observed as geomagnetic variations and ionospheric disturbances. These phenomena have their origins in the magnetosphere. Therefore, magnetospheric information is essentially important for understanding Geospace phenomena. However, although ionospheric and surface observation data are relatively abundant, magnetospheric data corresponding to ionospheric observations are not sufficient. Consequently, the magnetospheric information from the global MHD simulation, REPPU, is regarded as useful to the community. To contribute to the community, we plan to release the numerical results of the global magnetohydrodynamic simulation, REPPU.

REPPU code originally made by Prof. T. Tanaka [2015] is improved in this project to include the effect of the precession of the Earth's rotational axis, a daily rotation of the magnetic axis around the rotational axis, and three components of the IMF and solar wind velocity from the OMNI at https://omniweb.gsfc.nasa.gov/form/omni_min.html. The improved REPPU code is essentially the same as that used in NICT for Space Weather Forcast.

This time, the reanalysis data of the DP2 event in 2015/09/06 will be released on a trial basis. These data are calculated by the improved REPPU code with the optimized ionospheric conductivity by data assimilation based on SuperDARN potential data and the AE index.

Data information

All data are presented in the netCDF format.

- Magnetospheric data
  - file name "reppu_mag_*year_day of year_hour_minute*.nc"
  - Coordinate system: (x,y,z) in SM coordinate
  - Contents: plasma density, thermal plasma pressure, magnetic field vector, plasma flow vector, electric current vector
  - Sample IDL program : contour_mg_pre_netcdf.pro (This code draws the pressure distribution in the equatorial plane and the meridional plane in the SM coordinate.)
    (This code refers to the external code "read_netcdf.pro" at https://www.l3harrisgeospatial.com/docs/read_netcdf.html.)
- Ionospheric data
  - file name "reppu_iono_*year_ day of year_hour_minute*.nc"
  - Coordinate system: geomagnetic colatitude and the magnetic local time in the unit of degree
  - Contents: field-aligned current, electric potential, and the tensor components of the height-integrated conductivity (Σ_{xx}, Σ_{xy}, Σ_{yy}: suffices, x and y, mean northward and eastward,

respectively)

- Sample program: contour_is_fac_netcdf.pro

Contact

Shigeru Fujita
Joint Support-Center for Data Science Research
Research Organization of Information and Systems
sfujita@ism.ac.jp

Reference

Tanaka, T. (2015). Substorm Auroral Dynamics Reproduced by Advanced Global Magnetosphere-Ionosphere (M-I) Coupling Simulation. In Auroral Dynamics and Space Weather (eds Y. Zhang and L.J. Paxton). https://doi.org/10.1002/9781118978719.ch13

Acknowledgments

This project was supported by "Challenging Exploratory Research Projects for the Future" grant from ROIS (Research Organization of Information and Systems).