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Zoom meeting C ：11/4 PM1 (13:45-15:30)
15:00〜15:15

Development of radiation belt forecast model based on the recurrent neural network

#SATOSHI FUKUOKA[1)],Yoshizumi Miyoshi[2)],Tomoaki Hori[2)],Takefumi Mitani[3)],Takeshi Takashima[4)],Nana Higashio[5)], Iku Shinohara[6)],Daikou Shiota[7)],Shinji Saito[7)],ChaeWoo Jun[8)]
([1]ISEE,Nagoya University,[2]ISEE, Nagoya Univ.,[3]ISAS/JAXA,[4]ISAS, JAXA,[5]JAXA,[6]ISAS/JAXA,[7]NICT, [8]ISEE, Nagoya Univ.

The relativistic/sub-relativistic electron flux variations often cause serious damage to the satellites operating in space through the dielectric charging. In order to forecast flux variations of these hazardous electrons, various forecast methods have been developed, based on physical-based simulations and empirical models for the high energy electrons. As a method with physics-based simulations, the SUSANOO, which operates a code-coupling simulation of the heliosphere and radiation belts, provides MeV electron flux variations for the next couple of days. As those employing the empirical modeling, the linear prediction filter (LPF) and the auto-regressive moving average (ARMA) have been commonly used for the forecast of MeV electrons at geosynchronous earth orbit (GEO). Recently, machine learning techniques have widely been used for the space weather forecast, for example, ionospheric variations, the flare prediction, etc. In this study, we have developed a forecast system of relativistic/sub-relativistic electron flux variations based on a long short-term memory recurrent neural network (LSTM-RNN). As the training data, we used the solar wind data and energetic electron flux data observed by Arase/HEP and XEP instruments at different L-shells of the outer belt. The developed network provides time variations of the energetic electron flux at L = 4, 5 and 6 using the solar wind data as input parameters. In this presentation, we evaluate how the solar wind parameters affect the temporal variation of the high-energy electron flux on the basis of the developed neural network model. We also report the results from another network developed using the nearly-real-time space weather data of Arase, with a view to the real time space weather forecast.