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Prediction of High-Energy Electron Flux at Geosynchronous Orbit by using the Neural Network

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It is important for spacecraft operation to predict the high-energy electron flux at the geosynchronous orbit, because the enhancement of high-energy electron flux often causes the deep electrical charging. In this study, we attempted to optimize the prediction accuracy of the temporal variation of the high-energy electron flux after 24 hours by the neural network. Firstly, the input data and the middle layer parameter used in the neural network were examined to validate the prediction efficiency. As a result, the prediction efficiency could be improved in the case that both the solar wind data and the ground magnetic data used in the input parameter compared to that either the solar wind data or the ground magnetic data were used. Secondary, the weights of the network were analyzed to clarify the dependency on the output result. We defined contribution index for the each input parameters by using the distribution of the weights of the neurons. It was found that the most contributed input parameter to the output result were Dst index and Vsw. The present result indicates the solar wind velocity and the Dst index are the most contributing parameters to increase the MeV electron at the geosynchronous orbit.

Keywords: Neural network, High-energy electron flux, Deep electrical charging