

R008-01

Zoom meeting D : 11/3 AM1 (9:00-10:30)

09:15-09:30

宇宙プラズマ現象予測モデル開発に向けた機械学習・数値シミュレーション・観測による学習データの整備

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Development of training data with collaboration of observation, MHD simulation and machine learning for space weather forecast

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The machine learning has become a powerful tool to find the relation between variables thanks to the deep learning technique. This performs greatly in the classification, regression and recently generative modeling in the engineering and commercial areas. However, due to the satisfaction of physical laws in the scientific research area, the application of machine learning has some difficulties. In particular, the generative modeling is very sensitive to scientific data since the generated data is not guaranteed by the physical laws.

To overcome these problems, we have tried to apply machine learning to space plasma physics. In the observation there are many lacks data in space and time. Using the technique of GAN (Generative Adversarial Networks), we have challenged to represent the lack data of aurora image by ASI (All-Sky Imager) of THEMIS. Now we use the natural training data not only the observation data and we have obtained the smooth represented data, however these data cannot satisfy the physical laws. Then we prepare the training data of only observation.

From this thought the preparing the training data is the most important for machine learning. Then we have prepared the global simulation data of magnetosphere using real solar wind data for the generation and forecast the configuration of the magnetosphere. These data are the very large size and time elapsed data so that the data set cannot be stored in often case and usual machine learning cannot treat these data set. However recently there are 3D CNN (convolutional neural network) and RNN (recurrent neural network) which can be trained by 3D data set and these data set may become very important. In this study, we show the database of this data set data, representation of the auroral image and their status.