R010-22
A 会場 ：9/25　AM2 （10:45-12:30）
11:40〜11:55

放射線帯外帯電子変動予測モデルの開発と XAI によるモデル解釈

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Development of an outer radiation belt forecast model using the XAI

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The radiation belt is a region in the inner magnetosphere where the most energetic electrons in geospace are trapped by the Earth's magnetic field. Large flux variations of energetic electrons are observed in association with geomagnetic disturbances, and a sustained large flux of the outer belt electrons often leads to the satellite anomaly. The prediction of flux variations for energetic electrons is therefore essential in mitigating these risks. We have developed a forecast model of the outer belt flux variation using the recurrent neural network (RNN) with the long short term memory (LSTM). This model is designed to forecast the time-variation of the electron flux in the outer radiation belt at energies ranging from several hundred keV to several MeV at L = 4-6. As inputs for the model, we used daily average solar wind parameters (solar wind velocity and IMF-Bz), and electron flux obtained by HEP and XEP onboard the Arase satellite for last three days. The model succeeded in predicting the electron flux for most of the time intervals to which the model was applied, although the forecast skill became small in cases when the flux decreased at high L positions. To improve the model in this regard, we have incorporated additional solar wind parameters into the model. The previous studies have indicated that the solar wind dynamic pressure contributes to the loss of the outer belt flux via magnetopause shadowing. In fact, our revised model, using the solar wind density, improves the forecast skill. Moreover, we have also incorporated eXplainable Artificial Intelligence (XAI) into our developed model to investigate relative contributions of the input parameters on the electron flux variations. The diagnosis using XAI technique indicates that the time-integrated value of southward IMF is more important than its simple daily average, suggesting that prolonged southward IMF causes the flux enhancement more efficiently in the outer radiation belt.