# Prediction of Spatio-temporal Variation for Electron Flux at Geostationary Orbits

*Hiroki Nomoto[1], Yasuhide Hobara[1], Hiroshi Kikuchi[1], Hayato Iibuchi[1], Michael A Balikhin[2]

1. The University of Electro-Communications, 2. The University of Sheffield

In this paper, we present the prediction model of energetic electrons (> 2 MeV) simultaneously at multi-points in the terrestrial radiation belt. Our model was based upon the nonlinear system identification technique so-called Multi-Input Single-Output NARMAX (Nonlinear Autoregressive Moving Average with Exogenous)[1-2]. To predict spatio-temporal dependences of the electron flux, we have used high latitude Pc5 ULF data at 8 different MLTs as external local forcing parameters and used global parameters such as solar wind parameters (solar wind velocity and pressure, IMF) and SYM/H. We have constructed the prediction model with 24-hour ahead prediction with 3-hour time resolution at 8 different MLTs. As a result, the model has high prediction performance. In addition, Pc5 ULF data contributes to improve the accuracy at some MLT indicative of local dependence of the electron flux. Figure 1 shows an example snap shot of spatial variation of the predicted electron flux. Correlation coefficient between observed and predicted flux at MLT near GOES15 is > 90%. We also have examined the correlation coefficient for the MLT without satellite data being available by comparing the prediction results at GOES13 (60˚W) based upon the GOES15 (135˚W) with sampled data from GOES13, the correlation coefficient is still found to be high ~ 70%. Moreover, the effect from geomagnetic storm on the prediction accuracy will be discussed.

Keywords: Geostationary orbit, Electron flux