URSI GASS 2021, Rome, Italy, 28 August - 4 September 2021

Multi-Point Simultaneous Prediction Model for Electron Flux at Geostationary Orbits

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In this paper, we demonstrate the multi-point simultaneous prediction model for energetic electrons with their energy > 2 MeV at based on GOES15 data. Our model was constructed 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 added high latitude Pc5 ULF data at 8 different MLTs as an external local forcing parameter in addition to global ones 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, our model indicates high prediction performance and the accuracy has been improved for some MLT taking into account local dependence of ULF field. Figure 1 shows an example of predicted snap shot of spatial variation of the electron flux. Prediction efficiency at MLT near GOES15 is > 90 %. We also have examined the prediction efficiency for the MLT without satellite data being available by comparing the prediction results at MLT of GOES13 based upon the GOES15 data with sampled data from GOES13, the prediction efficiency is still found to be high ~ 70%. Moreover, the effect from geomagnetic field upon the prediction accuracy will be discussed.

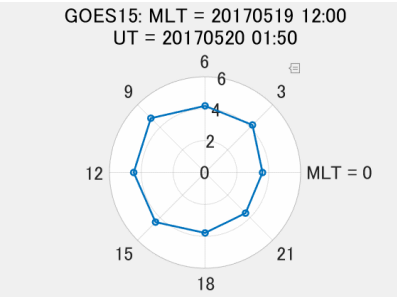

Figure 1. Spatiotemporal variation of predicted electron flux on May 20, 2017 at 1:50 UT

References

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