Nonlinear prediction model of ionospheric foF2 variability

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Nonlinear autoregressive with exogenous input neural network (NARXNN) for one step ahead prediction of the F2 layer critical frequency (foF2) at Kokubunji ionosonde station (35.72° N, 139.49° E) was developed. The daily or hourly variation of foF2 is an output, and solar activity (DOY1, DOY2, SSN, F10.7 index) and magnetic activity (Dst, AE, and Kp indices) parameters are the exogenous inputs with a time interval from 1 January 1964 to 31 December 2016. The performance of NARXNN model was evaluated by using the Pearson’s correlation coefficient (*r*) and root mean square error (RMSE). The results show that predicted values of foF2 have very good agreement with observed values. Moreover, the constructed model has a high Pearson’s correlation coefficient and a small RMSE. Therefore the constructed model based on the proposed methodology provides a good prediction of foF2 for Kokubunji ionosonde station, and solar flux at 10.7 cm is recognized as the most significant external forcings contributing to foF2 prediction.

Keywords: nonlinear autoregressive with exogenous input neural network, one step ahead prediction, foF2

