

Total Electron Content prediction model over Japan using an artificial neural network

NISHIOKA, Michi^{1*} ; TSUGAWA, Takuya¹ ; MARUYAMA, Takashi¹ ; ISHII, Mamoru¹

¹National Institute of Information and Communications Technology

Forecasting Total Electron Content (TEC) is important for Space Weather; for predicting propagation delay of the radio waves in the ionosphere. Although several empirical and theoretical models have been developed, no model is available for forecasting TEC over Japan. Our purpose is to accomplish an operational TEC model over Japan using an artificial neural network (ANN) technique which is developed by Maruyama [2007]. In our model, absolute TEC values for each day from 27°N to 45°N in latitude and 127°E to 145°E in longitude were projected on a two-dimension TEC map, that is, a local-time and latitudinal map. Then the time-latitudinal variation was fitted by using the surface harmonic function. The coefficients of the expansions were modeled by using a neural network technique. For the learning process, we used absolute TEC value from 1997 to 2013. The input parameters are proxies of the season, the solar activity, and the geomagnetic activity. Thus, daily two-dimensional TEC maps can be obtained for any day when the input parameters are provided. We used input parameters which are available in real-time by some institutes and achieved one-day TEC prediction over Japan.

Keywords: Ionosphere, Total Electron Content, Operational model, artificial neural network