

Total electron content forecast model over Japan using a machine learning technique

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Forecasting ionospheric condition is important for space weather operation, especially for predicting propagation delay of the radio waves in the ionosphere. National Institute of Information and Communications Technology (NICT), Japan, develops an ionospheric forecasting system of total electron content (TEC) in addition to a TEC monitoring system. Although several empirical and theoretical models have been developed in a decade, 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 technique which is developed by Maruyama [2007]. In our model, absolute TEC values for each day over Japan 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 2014. 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 days when the input parameters are available. We used input parameters which are provided in real-time by some institutes and achieved one-day TEC prediction over Japan.

キーワード : machine learning、total electron content、TEC forecast

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