

Modelling global vertical total electron content with neural networks

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Keywords *Machine Learning, Ionosphere, Feature Selection*

Abstract

This study addresses a two-step neural-network model of the vertical total electron content (VTEC), consisting of a temporal and a spatial component. The model is parametrized with geomagnetic and solar wind indices and their time histories combined with geomagnetic and geographic coordinates. The neural network parameters are tuned using five-fold cross validation and the features are chosen using Pearson correlation coefficient, permutation feature importance and mutual information. The performance of the neural networks is compared to the International Reference Ionosphere 2016. In addition to increasing the computational efficiency, the proposed approach allows to get physical insights into the dynamics of the ionosphere.