Variation of Ionospheric Model predictive accuracy with time

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A self-adaptive, time-series prediction method using radial basis functions has been developed at QinetiQ and forms the basis of a space weather forecasting demonstrator. This method has several advantages compared with other neural network techniques, such as Multi-Layer Perceptrons, in that the learning process is non-iterative and assured of a global optimum. In addition, methods have been developed to deal with the problems of noise and data drop-outs typical of solar-geophysical data sets. These techniques have been applied to a number of important space weather problems, including prediction of f0F2. The nonlinear technique employing has been applied to the prediction of the ionospheric parameter foF2. The accuracy of the model predictions over long periods is assessed, and is found to degrade with time. The results highlight the need for the retraining and re-optimization of neural network models on a regular basis to cope with changes in the statistical properties of geophysical data sets. Periodic retraining and re-optimization of the models resulted in a reduction of the model predictive error by ~0.1 MHz/6 months. A detailed examination of error metrics is also presented to illustrate the difficulties encountered in evaluating the performance of various prediction techniques