



A new approach for foF2 short-term forecasting using neuro-fuzzy modelling

J.M. Cordoba, J.M. Andujar and D. Marin

Department of Electronic, Computer Science and Automatic Engineering, University of Huelva, Spain (juanmanuel.cordoba@diesia.uhu.es)

A method for the F2 layer critical frequency, foF2, short-term prediction (1-24 hours in advance) based on neuro-fuzzy techniques is proposed.

In the field of artificial intelligence, neuro-fuzzy refers to hybrids of artificial neural networks and fuzzy logic. Neuro-fuzzy hybridization results in a hybrid intelligent system that synergizes these two techniques by combining the human-like reasoning style of fuzzy systems with the learning and connectionist structure of neural networks. Thus, neuro-fuzzy models incorporate, from fuzzy models, the facility of understanding and connexion with the physic process that it is modelling and, on the other hand, from neural networks based models, the capability of adaptation and learning. However, while a neural networks based model can be considered as “black box”, neuro-fuzzy models allow to incorporate expert knowledge in different parts of the modelling process.

Neuro-fuzzy techniques have not been extensively used in ionospheric modelling but its application in this field can be efficient and provide successful results. It is well known by scientific community the natural capability that these techniques show to model highly non-linear and complex systems. Due to the F2-layer variability any successful model describing the foF2 behaviour should be non-linear.

In this study, the basis of neuro-fuzzy modelling are explained and applied to predict the critical frequency foF2. Specifically, the proposed approach has been tested at Slough station for a two-year period (March 1980 - February 1982) using information of past foF2 observations and geomagnetic activity as neuro-fuzzy model inputs.