# A new global F2 peak electron density model for the International Reference Ionosphere (IRI)

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## Summary

In this paper we have described the development of a new neural network (NN) based global empirical model for the F2 peak electron density (NmF2) using extended temporal and spatial geophysical relevant inputs. The ability of the NN to deal with non-linear behaviour has been employed for modeling non-linear dynamic processes (both in time and space) associated with the F2 region of the ionosphere on a global scale. Measured foF2 data from 135 global ground based ionosonde stations, which includes all periods of quiet and disturbed magnetic activity, from various resources of the World Data Centre (WDC) archives (Space Physics Interactive Data Resource SPIDR, the Digital Ionogram Database, DIDBase, and IPS Radio and Space Services) have been used for training a NN. A comprehensive comparison for all conditions (e.g. magnetic storms, levels of solar activity, season and different regions of latitudes etc) between foF2 value predictions using the NN based model and International Reference Ionosphere (IRI) model (including both the International Union of Radio Science (URSI) and International Radio Consultative Committee (CCIR) coefficients) with observed values was investigated. The results presented in this paper, which compares favourably with the IRI model have demonstrated the justification of NN for spatial and temporal modeling of the ionospheric parameter foF2 globally. Again, comparisons of the NN model predictions with that of the IRI model and observed values at a few selected high- and low latitude stations have demonstrated successful application of the NN technique for modeling the complex irregularities associated with these regions of the ionosphere.