



Development and Current Status of Empirical Modelling of the Ionosphere

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Data-based (empirical) models play an important role in all parts of the geospace environment. They represent the synthesis of the accumulated empirical evidence for a specific parameter and region and based on past variation patterns predict the future variation of this parameter. They have the advantage over theoretical models that they do not depend on the evolving theoretical understanding of the processes that shape the particular region of space. However, they have the disadvantage that they are only as good as the data foundation on which they are based. For the ionosphere this a times led to a bias towards the Northern hemisphere, because the majority of the ionosonde stations were located in the Northern hemisphere. The advent of satellite observations helped to alleviate this problem but came also with a strong dependence on the temporal and spatial coverage achieved with a specific satellite orbit.

In actual fact, most ionospheric models are hybrids, using empirical as well as theoretical elements. An empirical model, for example, may use theoretical values to fill data gaps, whereas a theoretical model may use a data-based mapping for specific parameters as input (e.g., to represent neutral densities and temperature), or as a normalization tool for areas of model-data discrepancies.

I will present a brief review of the development and current status of empirical modelling of the ionosphere highlighting some of the evaluation and performance assessment of ionospheric models in individual studies and community projects.