Forecasting radar-observed equatorial spread F

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Abstract:

The ionosphere is a highly non-linear system in which a number of mechanisms interact and give rise to different irregularities, such as, the Equatorial Spread F (ESF). This phenomenon typically occurs at night-time and can negatively impact communication and navigation systems. Thus, an accurate occurrence prediction model would provide crucial information that could benefit the design of fault-tolerant systems. The main goal of this work is to evaluate and improve FIRST (Forecasting Ionospheric Real-time Scintillation Tool). We compare FIRST predictions for ESF occurrence with JULIA (Jicamarca Unattended Long-term Investigations of the Ionosphere and Atmosphere) SNR data. This model was originally developed to predict scintillations at early times of night (1930 LT) with h'F and F10.7 as inputs. In addition, FIRST has been tested by comparing its predictions to digisonde-observed ESF events, achieving an accuracy greater than 80%. Furthermore, we propose a neural network approach that considers some geophysical parameters as inputs and predicts ESF occurrence for different hours of the night. Finally, we explore the design of a system that predicts the evolution of the backscatter power measured by JULIA.

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References:

Redmon, R. J., D. Anderson, R. Caton, and T. Bullet (2010), A Forecasting Ionospheric Real-time Scintillation Tool (FIRST), *Space Weather*, 8, S21003, doi:10.1029/2010SW000582.

Anderson, D. N., and R. J. Redmon (2017), Forecasting scintillation activity and equatorial spread F, *Space Weather*, 15, 495-502, doi:10.1002/2016SW001554.

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