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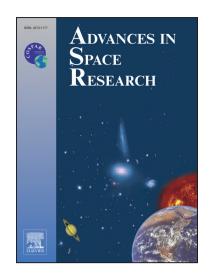
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Modeling ionospheric foF2 response during geomagnetic storms using neural network and linear regression techniques $^{\,\,\,\,\,\,\,}$

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Abstract

In this paper, the modeling of the ionospheric foF2 changes during geomagnetic storms by means of neural network (NN) and linear regression (LR) techniques is presented. The results will lead to a valuable tool to model the complex ionospheric changes during disturbed days in an operational space weather monitoring and forecasting environment. The stormtime $f \circ F2$ data during 1996-2014 from Grahamstown (33.3°S, 26.5°E), South Africa ionosonde station was used in modeling. In this paper, six storms were reserved to validate the models and hence not used in the modeling process. We found that the performance of both NN and LR models is comparable during selected storms which fell within the data period (1996-2014) used in modeling. However, when validated on storm periods beyond 1996-2014, the NN model gives a better performance (R=0.62) compared to LR model (R=0.56) for a storm that reached a minimum Dst index of -155 nT during 19-23 December 2015. We also found that both NN and LR models are capable of capturing the ionospheric foF2 responses during two great geomagnetic storms (28 October-1 November 2003 and 6-12 November 2004) which have been demonstrated to be difficult storms to model in previous

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