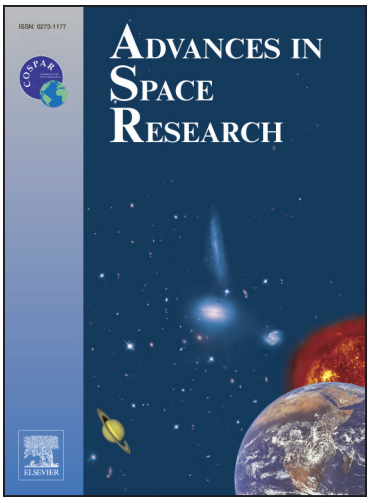

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Modeling ionospheric $foF2$ response during geomagnetic storms using neural network and linear regression techniques ☆

Mpho Tshisaphungo[a,b,*], John Bosco Habarulema[a,b], and Lee-Anne McKinnell[a,b]

[a] *South African National Space Agency, Hermanus, 7200, South Africa*
[b] *Department of Physics and Electronics, Rhodes University, Grahamstown 6140, South Africa*

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 storm-time $foF2$ 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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*Corresponding author

Email addresses: mtshisaphungo@sansa.org.za (Mpho Tshisaphungo), jhabarulema@sansa.org.za (John Bosco Habarulema), lmckinnell@sansa.org.za (and Lee-Anne McKinnell)