Comparative evaluation of NeQuick and IRI models over Polar Regions

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In the framework of the AUSPICIO (AUtomatic Scaling of Polar Ionograms and Cooperative Ionospheric Observations) project, the ionograms recorded at Hobart (middle latitude), Macquarie Island, Livingstone Island and Comandante Ferraz (middle-high latitude) and those recorded at the ionospheric observatories of Casey, Mawson, Davis, and Scott Base (Antarctic Polar Circle), have been taken into account to study the capability of NeQuick-2 and IRI-2012 models in predicting the behavior of the ionosphere, mainly in the polar region. In particular, the applicability of NeQuick-2 and IRI-2012 models was evaluated under two different modes: a) as assimilative models ingesting the foF2 and hmF2 measurements obtained from the electron density profiles provided by the Adaptive Ionospheric Profiler (AIP); b) as climatological models taking as input F10.7 solar activity index.

The results obtained from the large number of comparisons made for each ionospheric observatory when NeQuick-2 and IRI-2012 models work according to the two modes above mentioned, reveal that the best description of the ionosphere electron density at the polar regions is provided when peak parameter data are ingested in near-real-time into NeQuick-2 and IRI-2012 models which, indeed, are not always able to represent efficiently the behavior of the ionosphere over the polar regions when operating in long term prediction mode.

The statistical analysis results expressed in terms of root mean square errors (r.m.s.e.) for each ionospheric observatory show that, outside the Antarctic Polar Circle (APC), NeQuick-2 performance is better than the IRI-2012 performance; on the contrary, inside the APC IRI-2012 model performs better than NeQuick-2.