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Session 5B Paper 4
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A high latitude topside electron density representation for the Empirical Canadian High Arctic Ionospheric Model (E-CHAIM)

It has been shown, both through Incoherent Scatter Radar (ISR) and GPS Total Electron Content observations, that the topside representations of ionospheric electron density in empirical models, such as the International Reference Ionosphere (IRI) and NeQuick, suffer significant issues in their representation of seasonal, diurnal, and solar cycle variabilities at high latitudes (Themens et al., 2014; Themens and Jayachandran, 2016; Bjoland et al. 2016).

To address this issue, a new topside thickness model has been developed for use in these regions, both as a component of the E-CHAIM electron density model and as a stand-alone representation. This model incorporates all available data from the CHAMP, GRACE, and COSMIC radio occultation satellite missions, all data from the ISIS, Alouette, and Interkosmos-19 topside sounder missions, and all data available from the EISCAT Tromso, EISCAT Svalbard, Sondrestrom, Kharkov, Chatanika, Resolute, Poker Flat, Malvern, and Millstone Hill ISRs.

This study discusses the model parameterization, which is built around a spherical cap harmonic expansion, and the performance of the finalized model fit. A validation of the model using radio occultation profiles from the Canadian, e-POP GPS receiver-based Attitude, Position, and profiling experiment (GAP) will also be presented with comparisons to the IRI.

References:

Bjoland, L.M., V. Belyey, U.P. Lovhaug, and C. La Hoz (2016), An evaluation of International Reference Ionosphere electron density in the polar cap and cusp using EISCAT Svalbard radar measurements. Ann. Geophys., 34, 751-758, doi:10.5194/angeo-34-751-2016

Themens, D.R., and P.T. Jayachandran (2016), Solar activity variability in the IRI at high latitudes: Comparisons with GPS total electron content. J. Geophys. Res. Space Physics, 121, doi:10.1002/2016JA022664.

Themens, D. R., P. T. Jayachandran, M. J. Nicolls, and J. W. MacDougall (2014), A top to bottom evaluation of IRI 2007 within the polar cap, J. Geophys. Res. Space Physics, 119, 6689–6703, doi:10.1002/2014JA020052.