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Application of the IRI model to the HF propagation model with optimization of the ionosphere parameters to day-to-day variation

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Abstract

The HF propagation model, North Ionospheric Model and Ray Tracing (NIM-RT) was developed and tested for a number of years by comparing measured vertical and oblique ionograms over a number of radio links (especially in high latitude area) with the simulated ionograms. The present paper extends the model in order to include:

- a) Implementation of the data retrieved from the International Reference Ionosphere (IRI-2012) model into the software for radio channel modeling,
- b) The algorithm for IRI data optimization to the real time condition,
- c) Results of comparison between simulated and measured ionograms.

Based on these updates, a new software tool called North Ionospheric Model with IRI and Ray Tracing (NIMIRI-RT) was developed, and a number of vertical ionograms corresponding to multiple ionospheric reflections was simulated. The vertical ionograms observed at various ionosondes were compared with the synthesized ionograms, generated by applying NIM-RT in conjunction with initial and optimized IRI data. The ionogram structure simulated by NIMIRI-RT based on the data retrieved from optimized IRI is more reminiscent to the observations than ionograms synthesized with the initial NIMIRI-RT without parameters optimization.

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