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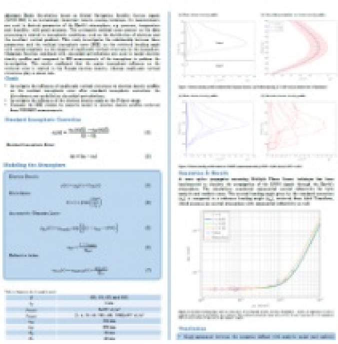
Poster

Radio Occultation based on Global Navigation Satellite System signals (GNSS-RO) is an increasingly important remote sensing technique where the terrestrial atmosphere is scanned from upper ionosphere down to Earth surface. The data product of the occultations provides valuable information with main application in Numerical Weather Prediction (NWP) algorithms. Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) is the most successful mission to produce ionospheric data from occultations. The ionospheric conditions are relevant once they have influence on the retrieval of lower troposphere parameters. The systematic error on the retrieved bending angle after the standard ionospheric correction is the main example. The standard correction relies on a linear combination of the L1 and L2 frequencies assuming both waves travelling the same path. However, waves are propagated in slightly different paths throughout the ionosphere for different frequencies which implies in a biased retrieval making GNSS-RO unsuitable for some applications, such as long-term climate change monitoring.

This study investigates the relationship between the vertical gradient, magnitude of the electron density in the ionosphere and the resultant residual error on the bending angle after the standard correction approach. A wave optics propagator, using Multiple Phase Screen (or the Fourier split step), was used to simulate the propagation of GNSS signals in the atmosphere. Initially, electron density profiles were defined by a double Chapman Layer model and combined to small sinusoidal oscillations with different amplitudes in the F-layer height range. Lately, simulations assuming electron density profiles from COSMIC database were performed in order to compare the results yielded from the oscillation models to the cases of real measurements.

The results clearly demonstrates the residual effect of the ionosphere on the neutral bending angle measurement error, which increases as long as either the amplitude or the gradient of the electron density increases. The numerical simulations are shown to be in quantitative agreement with previously published results which were based on a simple model for the signal dynamics and the structure of the atmosphere



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