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High-resolution multi-frequency ionospheric tomography in Scandinavia

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Ionospheric plasma content can be deduced from the characteristics of VHF/UHF signals acquired by ground-based networks of GNSS receivers, beacon satellite receivers and GNSS receivers on-board LEO satellites. The tomographic inversion of these data in a three-dimensional algorithm can reveal spatial and temporal distributions of the ionospheric plasma anomalies induced by magnetosphere-ionosphere coupling processes. Dense and expansive network of dual frequency GNSS and beacon receivers in Fennoscandia opens a unique opportunity for the mesoscale (tens of kilometres scale) ionospheric tomography with the existing network of other instruments (IS radars, magnetometers, etc.) providing a characterization of the ionospheric processes. The tomographic techniques are expected to benefit from the use of wide range of carrier frequencies (from 100 MHz to few GHz) as well as from the use of space-borne occultation GNSS receivers. We will present first mesoscale reconstructions over Fennoscandia obtained using various ionospheric mapping techniques. Directions for the future development of high-resolution 3D tomographic algorithms will be outlined.