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Tomographic Imaging of the Ionosphere Using GPS RO and NNSS Data

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In the study of tomographic imaging of the ionosphere, total electron content (TEC) data from a network of ground-based stations can provide detailed information on the horizontal structure, but are of restricted utility in sensing vertical structure. However, an occultation observation mission termed the Global Positioning System/Meteorology (GPS/MET) program used a low Earth orbiting (LEO) satellite (the MicroLab-1) to receive multi-channel GPS carrier phase signals (1.5GHz and 1.2GHz) and demonstrate active limb sounding of the Earth's atmosphere and ionosphere. In this study, we have implemented the Multiplicative Algebraic Reconstruction Technique (MART) to reconstruct and compare two-dimensional ionospheric structures from measured TECs through the receptions of the GPS radio occultation signals, the NNSS signals, and/or both of the systems. We have conducted a series of ionospheric imaging experiments to investigate the latitudinal structure of the equatorial ionization anomaly and have also concluded the profiles retrieved from tomographic reconstruction showing much reasonable electron density results than the original vertical profiles retrieved by the Abel transformation and being in more agreement in peak electron density to nearby ionosonde measurements.