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## Ionospheric tomography using ground-based GPS receiver networks in Japan, America and Europe

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An ionospheric tomography algorithm using the GPS Total Electron Content (TEC) data was developed to reconstruct the plasma density distribution from 80km altitude to 20,000km. Observation of the dual frequency radio wave from the Global Positioning System (GPS) can provide the Total Electron Content (TEC) data between satellites and receivers. The set of data from the array of the ground-based GPS receivers and the constellation of the GPS enables to derive the electron density distribution in the ionosphere and the plasmasphere by tomography algorithm. We developed an algorithm to derive the three dimensional distribution of the plasma density using GPS-TEC. We applied this tomography algorithm to the data in Japan, the North America and Europe. The distribution of the ground-based GPS receivers in Japan is denser than that in the North America, and the size of the observational area is wider in the North America than in Japan. Therefore the tomography in Japan is suitable to study the ionospheric structures whose scale is a few hundreds kilometer, and that in the north America is suitable to study the structures whose scale is a few thousands kilometer. The ionospheric plasma density was reconstructed for the cases of the geomagnetically quiet and disturbed times. The spatial and temporal variations of the reconstructed electron density was compared with the observation of the IS radars and satellites.

Keywords: GPS, Ionosphere, Tomography, Plasma density