

# Imaging the global vertical density structure from the ground and space

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**Abstract:** Although satellite observations demonstrate that there are large longitudinal differences in the ionospheric density distributions, the availability of uneven distribution of ground-based instruments hinders us not to understand the physics behind the global ionospheric density distributions. For example, understanding the physics behind the unique equatorial ionospheric irregularities in the African sector is still becoming a problem due to lack of ground-based instruments. The space-based GPS measurements on board Low Earth Orbiting (LEO) satellites are rather good datasets to monitor the ionosphere and plasmasphere on global scale. In this paper, we present different capabilities of GPS measurements onboard LEO satellites, providing (a) radio occultation (RO) density profiles to routinely monitoring the global ionospheric region below the LEO orbiting altitude and (2) topside ionosphere and plasmasphere integrated density values that can be used for space-based tomographic reconstruction techniques to remotely image the vertical structure of the topside ionosphere and plasmasphere density profiles.