

**New Perspective of the Ionosphere and Plasmasphere from GNSS Sensor
Constellations
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GNSS sensors hosted on Low-Earth-Orbit (LEO) satellites have become one of the most popular type of sensors for exploring the near-Earth environment. They are capable of providing observations from the Earth's surface through the Plasmasphere utilizing line-of-sight (LOS), radio occultation technique (RO), and reflectometry measurements. GNSS sensors may take advantage of the different GNSS constellations available including GPS (USA), GLONASS (Russia), Galileo (Europe), and Beidou (China). Currently, LEO GNSS sensors primarily utilize the GPS constellation signals. Even by tracking only GPS signals, a single LEO GPS sensor provides a large volume of data. For example, 300-400 radio occultation measurements are produced per day for a single GPS sensor. Utilizing all of the available GNSS signals will increase this number at least 3-fold and significantly improve the measurement resolution that can be achieved from a single GNSS sensor. Expanding further to include a constellation of satellites hosting GNSS sensors, it becomes possible to provide truly global observations and mapping of regions.

This presentation will focus on the potential of constellations of small satellites hosting GNSS sensors to provide imaging of the ionosphere and plasmasphere. GNSS sensors provide total electron content (TEC) and scintillation (e.g S4) measurements through LOS and RO observations. The LOS TEC measurements can be used in an assimilative model or tomography can be employed to provide a 3-D image of the ionosphere/plasmasphere. Both will be techniques will be discussed. Several types of GNSS sensor constellations concepts are explored from small satellites (e.g CYGNSS) to CubeSats. In addition, the possibility of mapping the ionosphere/plasmasphere utilizing LOS and RO data from the GPS/GLONASS sensor on the upcoming COSMIC-2 mission is presented.