Low Latitude Ionospheric Observations with IOX and CORISS

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GPS occultation sensors have the potential to provide us with new insights into the physics of the low latitude ionosphere. Of particular interest are the possibility of globally distributed measurements of F-region parameters (peak density, altitude, topside scale height), height-resolved observations of ionospheric scintillation, and measurements of the E-region before and after sunset. The strengths of the occultation technique are its excellent vertical resolution and high inherent precision. Its primary weakness arises from difficulties in data interpretation associated with the convolution of its limb-viewing geometry and ionospheric structures. Data from the Ionospheric Occultation Experiment (IOX) will be used to illustrate these strengths and weaknesses. IOX is a dual-frequency GPS receiver similar to the Orsted and SunSat GPS instruments, but having better L2 performance. IOX has been making ionospheric occultation measurements since November 22, 2001 from a 67 degree inclination, 800 km altitude orbit on September 30, 2001. Most occultation measurements are made at a 1 Hz (so-called medium rate) cadence, but some high rate (50 Hz) observations at ionospheric tangent altitudes are also made. In addition to specific examples, a brief overview of the IOX database will be presented. IOX observations provide a preliminary sense of the types of analyses that will be enabled by the next occultation sensor with an exclusively ionospheric mission focus: the C/NOFS Occultation Receiver for Ionospheric Sensing and Specification (CORISS). A part of the Air Force's Communication/Navigation Outage Forecasting System (C/NOFS), the CORISS instrument is expected to be launched into an equatorial (13 degree inclination) orbit in early 2004, enabling continuous monitoring of the equatorial ionosphere. Because ionospheric morphology is ordered by the earth's magnetic field, occultation observations made from an equatorial orbit are expected to have a somewhat different character from those in a high-inclination orbit.