C/NOFS Observations of Plasma Depletions at Sunrise

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We present early Communication/Navigation Outage Forecasting System (C/NOFS) satellite results related to plasma irregularities observed at sunrise. C/NOFS was launched on 16 April 2008 into a low inclination (13°), elliptical (400 x 850 km) orbit. The satellite sensors measure the following parameters: ambient and fluctuating ion densities; ion and electron temperatures; neutral winds, AC and DC electric and magnetic fields. On several occasions, deep plasma depletions are observed at sunrise. Within these sunrise-associated narrow plasma depletions (100 to 200 km wide), the electron density can decrease by more than one order of magnitude. These depletions are seen at all satellite altitudes. They are associated with upward plasma drifts, plasma irregularities and elevated electron temperatures. They occur close to the magnetic equator, and have a clear longitudinal dependence. They are more frequent in the America-Africa sector, and, to a lesser extent, in the Indonesia sector. Sunrise depletions are also observed in the Defense Meteorological Satellite Program (DMSP) morning passes. DMSP orbit is circular at ~ 850 Km altitude, and sun-synchronous crossing the equator at ~ 5:30 to 7:30 LT.

Burke et al. (JGR, 84, A8, 1979) observed similar plasma depletions in DMSP data taken in 1977. We conjecture that these depletions and associated irregularities are mostly solar-minimum phenomena, and we offer possible explanations for their formation.