

# **The Communication/Navigation Outage Forecasting System (C/NOFS) Mission to predict ionospheric densities and scintillation**

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The Communication / Navigation Outage Forecasting System (C/NOFS) Mission of the Air Force Research Laboratory is described. The purpose of C/NOFS is to forecast ionospheric density and irregularities that adversely impact communication, navigation and surveillance systems. A satellite, scheduled for launch in 2006 into a low inclination ( $13^\circ$ ), elliptical ( $\sim 375 \times 710$  km) orbit, is the main component of C/NOFS. Complementary ground-based measurements are also part of the Mission. The satellite sensors will measure the following parameters: ambient and fluctuating electron densities; ion and electron temperatures; neutral winds, AC and DC electric and magnetic fields. C/NOFS will also be equipped with a GPS occultation receiver, and a radio beacon.

Models have been developed at AFRL that ingest C/NOFS data in order to forecast the ambient ionosphere and scintillation regions. The models are validated using ground and satellite instrument data. Ion drift measurements at the magnetic equator (Jicamarca, Peru) were used as input for some of these validation runs. Close to Jicamarca, the density model usually shows satisfactory agreement with the ground truth data. The variation of density as a function of latitude, however, is not always as well represented by the model. Several factors contribute to this problem, specifically, lack of knowledge of the neutral winds, neutral composition, and ion production rates beyond the level of simple empirical models. Validation studies using the GUVI EUV sensor on the NASA TIMED satellite will also be shown. The validation studies clearly demonstrate the need for improved measurements of ionospheric and thermospheric parameters in the equatorial regions. C/NOFS and collaborative ground and satellite observations will hopefully provide these measurements and greatly enhance our predictive capability.