

## Project Details

**ROSES ID:** NRA-03-OSS-01

**Selection Year:** 2004

**Program Element:** Independent Investigation: LWS

**Project Title:**

Solar-Cycle and Short-Term Variations of Topside Ionospheric Electron-Density Profiles

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**Project Member(s):**

- Grebowsky, Joseph M; COI; NASA Goddard Space Flight Center
- Ormes, Jonathan F; Authorizing Official; Goddard Space Flight Center
- Bilitza, Dieter ; Collaborator; Raytheon ITSS
- Webb, Phillip Arthur; Other Professional; USRA/GSFC
- Huang, Xueqin ; Other Professional; Center for Atmospheric Research

**Summary:**

The overall objective is to determine the dependence of the mid-latitude topside ionospheric electron-density (Ne) altitude distributions on long-term solar-cycle variations and short-term solar-wind and magnetic disturbances. The main focus will be on Ne profiles from the height of the ionospheric Ne maximum to ~ 3,000 km as deduced from ISIS (International Satellites for Ionospheric Studies) topside-sounder data. These data, obtained over an 18-year time interval, will be used to investigate secular changes in the topside Ne profiles, which reflect altitude changes in plasma temperature and ion composition, over more than a solar cycle. In addition to providing average distributions the data, which extend from the O+ dominated high-altitude F region to the H+ dominated plasmasphere, provide a unique framework for delineating the altitude dependence of mid-latitude ionospheric structures associated with the plasmopause, plasmaspheric tails and Storm Enhanced Densities. The approach will be to (1) extend the digital ionospheric topside-sounder data base at the National Space Science Data Center (NSSDC) back to the solar minimum of 1965, (2) process all digital topside-sounder ionograms recently made available at the NSSDC into topside Ne profiles (making them also available to the scientific community via the NSSDC) and (3) relate latitude/local-time changes in the average mid-latitude topside Ne profile characteristics, particularly scale-height variations, to changes in solar-activity indices, solar-wind parameters and geomagnetic indices. Our objective supports the Living With a Star (LWS) goal "to develop the scientific understanding - to effectively address those aspects of the connected Sun-Earth system that affect life and society" in that a knowledge of mid-latitude topside ionospheric structures and their dependence on solar conditions is needed to mitigate the ionospheric impacts on advanced technological systems, such as GPS positioning, where the ionospheric effects on trans-ionospheric radio propagation is often the limiting factor on overall system performance. It supports the LWS Targeted Research and Technology broad objective #1 by performing " -the analysis and interpretation of past and present data to identify and understand the basic physical processes underlying the Sun-Earth system -" and also one of the research topics listed of high current interest, namely, "The effects of varying solar EUV radiation on the Earth's ionosphere and atmosphere."

## Publication References:

**Summary:** "

**Reference:** Robert Benson / Goddard Space Flight Center-Solar-Cycle and Short-Term Variations of Topside Ionospheric Electron-Density Profiles

**Summary:** no summary

**Reference:** Webb, P. A.; Benson, R. F.; Grebowsky, J.; (2006), Altitude variations of middle-latitude topside ionospheric electron-density profiles, *Advances in Space Research*, Volume 37, Issue 5, p. 951-957, doi: 10.1016/j.asr.2005.05.130