

Topic: Determine and Quantify the Responses of Atmospheric/Ionospheric Composition and Temperature to Solar XUV Spectral Variability and Energetic Particles

Project Title:

Thermosphere--Ionosphere Response to Variability of Solar X-ray and EUV Radiation During Solar Flares

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Project Information:

We propose to carry out an observational and modeling investigation of characteristics and driving mechanisms of the spatial and temporal responses of the thermosphere and ionosphere to rapid changes of solar X-ray (0.1-10 nm) and EUV (10-120 nm) radiation during solar flares. The primary scientific objectives are:

- (1) Understand how locations of flares on the Sun affect their spectral characteristics and hence the neutral density and TEC responses;
- (2) Examine whether neutral density and TEC responses scale directly to the intensity of solar flares as classified by their X-ray brightness for flares with the same location on the Sun;
- (3) Investigate the timing of the response and recovery of the neutral density and TEC responses and the coupling/decoupling of the two as the flare responses evolve with time;
- (4) Study whether the hemispheric asymmetry of the TEC response is coupled to the hemispheric asymmetry of O/N2 and whether there is hemispheric asymmetry in the neutral density response to solar flares.

TIMED Solar EUV Experiment (SEE), GOES X-Ray Sensor (XRS) , SDO EUV Variability Experiment (EVE), and a new flare model (FISM) will be analyzed for solar flares from 2001 to 2007; effects of these flares on the IT system will be investigated using TEC data (CHAMP, ground-based GPS) and neutral density data (CHAMP). These observational studies will result in establishment of characteristics of flare spectra and the IT responses. A modeling effort using the NCAR-TIMEGCM will be carried out in conjunction with these observational studies. The modeling effort will enable us to investigate the flow of physics and chemistry as the flare affects the ionosphere and the thermosphere. These combined observational and modeling studies will bring a better understanding of how the impulsive bursts of X-ray and EUV during solar flares affect the thermosphere and the ionosphere.

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Program Element: Focused Science Topic

Citations:

Summary: no summary

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Summary: no summary

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Summary: no summary

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Summary: no summary

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Summary: no summary

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