Project Details

ROSES ID: NRA-NNH04ZSS001N
Selection Year: 2005
Program Element: Focused Science Topic

Topic: To quantify the response of thermospheric density and composition to solar and high latitude forcing.

Project Title:
Improvements in solar irradiances during flare periods for use in thermospheric and ionospheric models

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Summary:
We propose a targeted and focused investigation that will provide substantial improvements in solar irradiances for use during flare periods in thermospheric and ionospheric research and operational models. Our proposed effort takes the next major step of a long-term project to improve solar soft X-ray (XUV) and extreme ultraviolet (EUV) irradiance specification, especially during solar flare periods. Our top research objective is to characterize solar XUV and EUV flare energy that is deposited into the terrestrial thermosphere and ionosphere with a spectral and temporal accuracy, precision, and validation not previously achieved. Secondly, we aim to predict the short-term evolution of solar flares that impact the coupled thermosphere and ionosphere systems. Thirdly, we will provide a research and operational tool that dramatically captures solar flare impacts for use by the research and operations communities. Four major tasks will be performed enabling us to accomplish these objectives. First, to obtain high time resolution irradiances in the XUV "EUV, we will use recently developed XUV flare indices that provide flare evolution detail over a few minutes. Next, these indices will be translated into electron effective temperatures and emission measures allowing increased XUV "EUV spectral resolution through the incorporation of the atomic physics databases of Chianti and APEC into the SOLAR2000 model. For a 0-6 hour prediction capability, we will improve an XUV "EUV flare evolution model using a flare index derivative. Finally, we will conduct a three part validation of our work using data and physics-based as well as empirical models. The improved spectral and temporal irradiances will be compared with TIMED SEE irradiance measurements. The new spectral, time-resolved, and predicted flare evolution XUV "EUV irradiances will be used in the physics-based 1DTD thermospheric density model with results compared to subsolar HASDM mass density data. We will also quantify the uncertainty and skill score in the flare evolution model s prediction capability through comparison with ionospheric TEC data during quiet and perturbed solar activity conditions and with SOHO SEM data. The SOLAR2000 Research Grade, Professional Grade, and Operational Grade models will be the tools that we provide to the research and operations community to capture the results of our 3-year performance period.

Publication References:

Summary: no summary

Reference:
Woods, Thomas N.; Eparvier, Francis G.; Bailey, Scott M.; Chamberlin, Phillip C.; Lean, Judith; Rottman, Gary J.; Solomon, Sta nley C.; Tobiska, W. Kent; Woodraska, Donald L.; (2005), Solar EUV Experiment (SEE): Mission overview and first results, Journal of Geophysical Research: Space Physics, Volume 110, Issue A1, CiteID A01312, doi: 10.1029/2004JA010765