Abstract Form for the 2012 SORCE Science Meeting – Annapolis, MD, Sept. 18-19

Models of Spectral Irradiance Variability

Origins in the solar atmosphere and impacts on Earth's atmosphere

Session Themes (identify your preference if you have a preference):

_____ ***1. Modeling of the solar atmosphere with emphasis on spectral irradiance***
__X___***2. Modeling of the solar influence on Earth climate***
_____ ***3. Observations of solar spectral irradiance variability***
_____ ***4. Observations of the solar influence on Earth climate***

Oral or Poster Preferred: **Oral (Invited)**

Author(s): **Charles H. Jackman**

Affiliation(s): **Atmospheric Chemistry and Dynamics Laboratory**
Code 614, NASA Goddard Space Flight Center
Greenbelt, MD 20771

Title: **The Influence of Large Solar Proton Events on the Atmosphere**

Abstract Text (250 words or less):

Solar proton events (SPEs) can cause changes in constituents in the Earth's polar middle atmosphere. A number of large SPEs have occurred over the past 50 years and tend to happen most frequently near solar maximum. The highly energetic protons cause ionizations, excitations, dissociations, and dissociative ionizations of the background constituents. Complicated ion chemistry leads to HO_x (H, OH, HO_2) production and dissociation of N_2 leads to NO_y (N, NO, NO_2, NO_3, N_2O_5, HNO_3, HO_2NO_2, $ClONO_2$, $BrONO_2$) production. Both the HO_x and NO_y increases can result in changes to ozone in the stratosphere and mesosphere. The HO_x increases lead to short-lived (~days) ozone decreases in the mesosphere and upper stratosphere. The NO_y increases lead to long-lived (~several months) stratospheric ozone changes because of the long lifetime of NO_y constituents in this region. UARS HALogen Occultation Experiment (HALOE) instrument observations showed SPE-caused polar stratospheric NO_x ($NO+NO_2$) increases over 10 ppbv in September 2000 due to the very large SPE of July 2000, which are reasonably well simulated with the Whole Atmosphere Community Climate Model (WACCM). WACCM-computed SPE-caused polar stratospheric ozone decreases >10% continued for up to 5 months past the largest events in the past 50 years, however, SPE-

caused total ozone changes were not found to be statistically significant. Small polar middle atmospheric temperature changes of <4 K have also been predicted to occur as a result of the larger SPEs. The polar atmospheric effects of large SPEs during solar cycle 23 and 24 will be emphasized in this presentation.

E-Mail as a .doc (preference) or .pdf: vanessa.george@lasp.colorado.edu