

UPPER ATMOSPHERIC DRIVER DETERMINATION USING  
DATA ASSIMILATION

C. F. Minter, T. J. Fuller-Rowell, M. V. Codrescu  
University of Colorado, NOAA Space Environment Center

Work has been conducted recently on developing a data assimilation system for specifying the thermospheric composition and density in near real time. Despite the ability to describe the physics of the upper atmospheric forcing, quantifying the time-dependent drivers still remains difficult during geomagnetic storm conditions. Incorporating the high latitude forcing into the data assimilation system requires knowledge of the spatial and temporal variations of the convection electric field and the auroral precipitation. One of the limitations in data assimilation systems for space weather applications comes from inaccurate knowledge of these drivers. Compared with the solar wind parameters that force the magnetosphere, the drivers of the upper atmosphere, although well understood, remain poorly quantified. At best, the globally averaged Joule heating rate at a given time is only known to within a factor of two. At a given location, this uncertainty can rise to a factor of ten. This research endeavors to better quantify the balance between solar and magnetospheric forcing over the range of solar and geomagnetic activity by observing the response, rather than just the conventional input parameters alone. Since the solar heating at low latitudes and the magnetospheric sources at high latitudes control the magnitude and spatial distribution of the global circulation, these drivers strongly affect the neutral composition and density structure. Observing the change in the neutral density and composition structure can provide an additional information source in specifying the spatial and temporal distribution of the upper atmospheric drivers. The improved driver specification may also improve the composition and density specification in the data assimilation scheme. The results of this research may eventually also improve our knowledge of the fundamental solar and magnetospheric sources in the upper atmosphere.

Abstract Submission Form  
2004 National Radio Science  
Meeting

Abstract: minter21019

Date Received: September 24, 2004

1. (a) Cliff Minter  
University of Colorado  
R/SEC  
NOAA Space Environment Center  
325 Broadway  
Boulder, CO  
80305 USA  
clifton.minter@colorado.edu
- (b) 303-497-3051
- (c) 303-497-4006
2. G - Ionospheric Radio and Propagation
3. (a) Ionospheric modeling and data assimilation
4. C - Contributed Paper,  
Program chair: Cliff Minter
5. No special instructions