Thermospheric Composition Changes in the Morning Sector in Association with Intense Substorm Activity and IMF By

J. D. Craven (GI and Dept. of Physics, University of Alaska Fairbanks)
D. J. Strickland (Computational Physics, Inc.)
R. R. Meier (E. O. Hulburt Center for Space Research, NRL)
G. Crowley (Southwest Research Institute)
A. B. Christensen (The Aerospace Corp.)
L. J. Paxton (JHU/Applied Physics Laboratory)
D. Morrison (JHU/Applied Physics Laboratory)
S. K. Avery (CIRES, University of Colorado)
C.-I. Meng (JHU/Applied Physics Laboratory)
P. R. Straus (The Aerospace Corp.)
C. M. Swenson (Utah State University)
R. L. Walterscheid (The Aerospace Corp.)

(i.e., The GUVI Team)

TIMED SWG Meeting
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Objectives

1. Brief review of DE-1 observations
   Morning-side decreased at 130.4 nm; implied O/N2 decrease
   IMF By dependence

2. Expectations from ground-based observations of neutral winds

3. GUVI observations of the O/N2 ratio that look like DE in the NH

4. GUVI observations of the O/N2-ratio temporal development in the two hemispheres
Thermospheric Winds, Northern Hemisphere

- Ground-based winds (Conde)
- Potential contours (Weimer)
Fig. 2. Vector neutral wind measurements for individual orbits of DE-2; a) orbit 1861, b) orbit 1755, c) orbit 1853 and d) orbit 1749. The winds are plotted in geomagnetic polar coordinates. The solar terminator is indicated by the curved hatched line. Where no FPI data are available, the WATS measurements are indicated by the dotted bars plotted at right angles to the track of the satellite. The hourly averaged IMF values from ISEE-3 taken for the hour preceding the pass are shown at left with the Kp and Ap indices. The wind scale is given at bottom right.
WEIMER: HIGH-LATITUDE ELECTRIC POTENTIALS

Electric Potential
$5.2 < B_T < 7.25 \text{ nT}$

Figure 4. Contour graphs of electric potential for $5.2 < B_T < 7.25 \text{ nT}$. 

D. Weimer, JGR, Oct '95
Reflections on DE-1 Observations

• Large-scale decreases in O 130.4-nm dayglow in morning, sunlit sector

• Apparent dependence on sign of IMF By
GUVI Image and O/N2, 2002/271, 2023 UT
GUVI O/N2, Quiet Day, 2024 UT

2002/271 2024 UT
MORNING SECTOR
ORBIT 4371

0/N2 RATIO

GEOGRAPHIC LATITUDE, DEGREES
Active Period, AE for 2002/274
GUVI Image and O/N2, 2002/274, 1449 UT
GUVI Image and O/N2, 2002/274, 2118 UT

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GUVI O/N2, Active Day, 1449 UT

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GUVI O/N2, Active Day, 2118 UT
O/N2 = ~ 0.5, Active Day
Conclusions

Morning sector GUVI-deduced O/N2 observations --

• Are consistent with expectations from DE-1 in the NH

• Are consistent in the two hemispheres for the expected By dependence -- a greater O/N2 decrease in the NH for By > 0

• Displays a hemispheric time differential, with the decrease detected many hours later in the SH for By > 0.