Particulate and plasma variations in NLC and PMSE during DROPPS 1 and 2 flights

H. D. Voss (1), P. A. Webb (2), W. D. Pesnell (3), J. Gumbel(4), M. P. Assiss (1), and R. A. Goldberg (3)

1. Taylor University, 236 Reade Ave., Upland, IN 46989, USA (hnvoss@taylor.edu / Phone: 765 998 4843)
2. University of Maryland, NASA/GSFC, Code 612.3, Greenbelt, MD 20771, USA
3. NASA/GSFC, Code 612.3, Greenbelt, MD 20771, USA
4. MISU, Stockholm University, Svante Arrhenius vag 12, 10691 Stockholm, Sweeden

High-time resolution rocket measurements have been made of charged particulates under polar summer mesospheric conditions on 5 and 14 July 1999 during the DROPPS campaign at Andøya Rocket Range, Norway. Each rocket carried a Particle Impact Detector (PID) composed of two telescopes with three biased grids, and which were pointed into the rocket ram during both up- and downleg. On the first night, the rocket (DROPPS 1) was flown into a strong PMSE (polar mesospheric summer echo) condition with a weak NLC (noctilucent cloud) located at the base of the PMSE. The second flight (DROPPS 2) was launched into a bright NLC with no PMSE present. For DROPPS 1, large amounts of negatively charged particulates were observed in the PMSE region with relatively small size distributions ($>$1 nm radius). Net positive charge particulates were measured in the NLC regions for both flights. Ions and charged particulates have been simulated using a finite difference code (SIMION 3D) to trace particle paths and resulting grid currents. For the simulations the thermal effects through the shock and within the sensor cause the ice/rocky particulates to sublimate and lose mass. In addition, the particulates are observed to decelerate due to the ram pressure and electric fields for subsequent charge collection on the grids. The background current on grid 2 (-4 volt) is consistent with the altitude variation and flux expected for UV photoionization. Consistent effects were observed on another instrument (PAT, particle trap) during the same flights.