AOGS 2005

OBSERVATIONS OF SOLAR AND MAGNETOSPHERIC PARTICLES DURING LARGE STORMS AND ASSESSING THEIR EFFECTS ON THE EARTH'S UPPER ATMOSPHERE

D.N. BAKER, C.A. BARTH[1] S.G. KANEKAL[1], C. SAETRE[1], and S.M. BAILEY[3]

[1] *Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder, Boulder, CO 80303-7814*
[2] *Department of Physics/Geol. Inst., U. of Alaska, Fairbanks, AK 99775*

Coronal mass ejections (CMEs) moving at high speed often are observed by SOHO to emerge from near the central region of the Sun. In many cases, Type-II and Type-III radio emissions are also observed by the Wind spacecraft, indicating the onset of particle acceleration near the solar corona. If the active region on the Sun responsible for such events is magnetically well-connected to the Earth, this can lead to a prompt enhancement at 1 A.U. of solar particles (E>10 MeV) as seen by the ACE and SAMPEX spacecraft. Strong shock-related particle acceleration often continues to occur as CMEs propagate outward from the Sun toward the Earth. Strong solar wind drivers can in turn produce large increases in magnetospheric particle populations. We are particularly focused in this talk on geomagnetic storm intervals in 1998, but we also examine events around solar maximum in 1999-2002. The energetic particles produced near the Sun, at interplanetary shock waves, and deep within the Earth's magnetosphere are observed over the polar regions using the Polar/PIXIE X-ray experiment. The sensors onboard the Student Nitric Oxide Explorer (SNOE) spacecraft show these events to produce substantial increases of the nitric oxide in the Earth's upper atmosphere. In this talk we examine the impacts of major storm events on atmospheric particle precipitation rates and on atmospheric chemistry in the thermosphere. Using the constellation of available spacecraft, we are able to follow with remarkable completeness the particle chain from the Sun's surface all the way to the upper layers of Earth's atmosphere. We present detailed information on intensities, energy spectra, and anisotropies of the solar and magnetospheric particle populations and assess their impacts on the Earth's atmosphere.