OBSERVED VARIATIONS OF EARTH'S RADIATION BELT INTENSITIES ON ANNUAL AND SOLAR CYCLE TIME SCALES

D.N. BAKER and S.G. Kanekal

Laboratory for Atmospheric and Space Physics, Univ. of Colorado, Boulder, CO 80303-7814, e-mail: daniel.baker@lasp.colorado.edu

The Earth's radiation belts show pronounced differences in their characteristics as the Sun's magnetic and solar wind properties change over the approximately 11-year solar cycle. Solar coronal holes can produce regular, recurrent solar wind stream interactions in geospace, often enhancing highly relativistic electrons and causing recurrent magnetic storms. These phenomena are characteristic of the approach to solar minimum. This contrasts with major geomagnetic disturbances associated with aperiodic coronal mass ejections that occur most frequently around sunspot maximum. The high-energy trapped electrons can produce deep-dielectric charging in spacecraft systems and subsystems. Rapid discharging during electron irradiation can cause severe (or even fatal) operational anomalies in operating spacecraft. We present observational and modeling results that demonstrate the electron acceleration and loss effects throughout the inner part of geospace during various parts of the solar cycle. We place particular emphasis on long-term, homogeneous data sets from the SAMPEX and POLAR missions where we currently are studying enhancements near the slot region and in the inner zone. We discuss how present and future missions can contribute to International Living With a Star (ILS) goals and to improved understanding of electron acceleration, loss, and operations impacts.

Radiation belts, Inner magnetosphere, Solar cycle

Daniel N. Baker, Laboratory for Atmospheric and Space Physics, 1234 Innovation Drive, Boulder, CO 80303-7814, tel: 303-492-4509, fax: 303-492-6444, e-mail: daniel.baker@lasp.colorado.edu