Measurement and Warning of Geo-magnetospheric Radiation Environment – Overview & Plan

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Studies of the flux variability (short- and long-term) of radiation belt particles in the inner magnetosphere are particularly important, not only for improving our understanding of the relevant phenomena associated with them, but also for engineering considerations *viz. a viz*. spacecraft anomalies due to space environment effects (Electro-Static Discharge (ESD), Single-Event Upset (SEU), Total Dose, and Non-Ionizing Energetic Radiation Effects). Therefore, ongoing radiation measurement and monitoring by satellites is a requirement. The current status of measuring radiation using JAXA satellites is reviewed. Starting with Engineering Test Satellite-V (ETS-V; KIKU-5 in Japanese) in 1987, efforts to conduct radiation measurements in space have continued using almost all former NASDA (now JAXA) satellites (ETS-VI, ADEOS, ADEOS-II, MDS-1, DRTS (ongoing), and ALOS (ongoing)), in geostationary orbit (GEO), geostationary-transfer orbit (GTO), and low-Earth orbit (LEO). Electrons, protons, alpha particles, and heavy ions have been the main objects of study.

We have experienced the effects of solar activity in two recent spacecraft anomalies.

(1) The Advanced Earth Observing Satellite II (ADEOS-II; Midori-II in Japanese), a low-altitude polar Sun-synchronous satellite with an altitude of 800 km, suffered a catastrophic power failure in October 2003. Solar cell power output dropped from 6 kW to 1 kW in 3 minutes (from 1613 to 1616 UT) on October 24. Just before the anomaly, the magnetopause was compressed to below geosynchronous orbit, according to energetic particle and magnetic field data from GOES-12. It appears that the event occurred as the magnetopause was recovering. I will discuss the results of the Midori-II catastrophic discharge anomaly investigation.

(2) The GEO-orbiting Data Relay Test Satellite (DRTS), also known as Kodama in Japanese, entered safe mode, essentially shutting down all non-critical functions, on the morning of Oct. 29, 2003 (JST). Three-axis attitude control of Kodama was then recovered on Nov. 7, 2003, at 2119 JST.

I will report what occurred on the satellite, the solar flare alert, an ESD alert, and a geomagnetic storm alert using space weather (now ongoing).

Future plans for radiation monitoring in Japan, including GOSAT, Jason-2, SmartSat

and ISS/JEM/SEDA-AP, are presented.