AOGS 2006

Measurement and Warning of Geo-Magnetospheric Radiation Environment — Overview & Plan —

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In the inner magnetosphere, studies of the flux variability (short- and long-term) of radiation belt particles 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, and Single Event Upset: SEU, Total Dose, and Non Ionising Energy Loss: NIEL, etc.). Therefore, ongoing radiation measurements and monitoring by satellites is a requirement . The current status of radiation measurements using JAXA satellites is reviewed. Starting with ETS-V (Engineering Test satellite-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), ALOS(ongoing)), in the following orbits: 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 on 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 loss failure October 2003. Solar cell power output dropped from 6 kW to 1 kW in 3 minutes from 16:13 to 16:16 UT on October 24. Just before the anomaly occurred, 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 (JST), 2003.3-axis attitude control of Kodama was then recovered on Nov.7, 21:19 JST, 2003. I will report what occurred on the satellite, and solar flare alert, ESD alert, and geomagnetic storm alert using space weather (now ongoing). Future plans (GOSAT, Jason-2, SmartSat and ISS/JEM/SEDA-AP) for radiation monitoring in Japan are presented.