

Study on long-term variation of solar cell output of Akebono satellite

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Solar cells on any satellite degrade gradually due to severe space radiation environment. We found a fair correlation between the decrease rate of solar cell output current of Akebono satellite orbiting in the inner magnetosphere and trapped proton flux between 1989 and 1992, and reported the results elsewhere. After 1993, as a result of long-term degradation, variation of solar cell output seems more susceptible to other causes such as high temperature effect, and simple monthly averaged data show no significant relation between them. One of possible causes for the temperature variation of the solar cells is solar radiation with eccentric earth's orbit and another is terrestrial heat radiation with changing orientation of solar cell panels towards the earth. In order to remove possible temperature effect, we analyze difference of the output current for a month from that for the same month in the previous year. Then we select the data of the same distance (i.e., the same amount of the solar radiation) from the sun. We also sort the data by the geocentric angle of the satellite position from the sun-earth line. The data taken near the angle of 90 degree are expected to be least affected by the terrestrial heat radiation, because the satellite is solar-oriented with the solar cells facing towards the sun. The analysis method leads us to successfully deduce a continuous correlation between the decrease rate of solar cell output and > 10 MeV trapped proton flux up to 1998.

Keywords: Akebono satellite, proton radiation belt