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Magnetospheric particle sampling based on the instrument response function to anisotropic pitch angle distribution

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Magnetospheric particle precipitation flux in the atmosphere has been studied since the nineteen seventies using particle fuelescopes on parent satellites. The particle flux calculation by dividing the particle count rate by the instrument geometric factor leaves out anisotropic pitch angle distribution of the particles. Consequently, the comparison of particle fluxes measured by particle telescopes of differing orientations on board the parent satellites of different orbital inclinations pertaining to different of altitudes and epochs is not done correctly. A geometrical method has been developed that takes into account the telescope orientation and the satellite orbital inclination to find the sampling efficiency of different pitch angles. Using rotation matrices, the components of the unit vector in the geomagnetic coordinate system in a dipole magnetic field are found in the detector coordinate system at the observation latitude, longitude, and the radial geocentric distance. Pitch angles are measured with respect to the guiding field direction passing through the detector position. The pitch angle sampling factor is used in the calculation of detector response functions to particles of different pitch angles. The particle flux measured by the detector with the axis tilted in the local zenith direction in the ONR-602 Experiment on board the polar orbiting US Air Force S81-1 mission below 300 km in the early eighties compares well with that of the Azur Sun-sensored telescope on board the German Research Satellite above 400 km in the early seventies. Old satellite data on particle fluxes can now be reliably revisited to know the past history.

Biography

Miah Muhammad Adel entered the teaching career in 1975 after receiving the MSc degree in Physics from Rajshahi University in Bangladesh. On study leave abroad, he received the PhD degree in Physics from the Louisiana State University in Baton Rouge in the USA in 1988. He worked with the US Air Force S81-1 mission and the Japanese EXOS-C satellite data. In the mid-nineties, he started developing expertise on water resources in the Ganges basin. With almost fifty-fifty in each of the space physics and the water resources disciplines, he made more than 50 publications. He authored a few books on water resources and one on protection from lightning strikes.

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