

# Statistical Properties of Low Energy Heliosphere Particle Fluxes from 1.4 to 5 AU Over a Solar Cycle

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We present statistical studies of high resolution ion and electron energy spectra ( $\sim 50$  keV to  $\sim 5$  MeV) as measured by the HI-SCALE instrument on the Ulysses spacecraft over a time interval longer than a solar cycle (from launch in 1990 to nearly the present). Ulysses was the only spacecraft that continually measured the inner ( $\sim 1.4$  to  $\sim 5$  AU) heliosphere particle population during these years. The data thus provide measures of the lower energy population of particles that a spacecraft traveling outward from Earth would have encountered, and that also impacted the atmosphere and surface of Mars and the surfaces of the Martian satellites, Phobos and Deimos, during this interval. Comparisons of Ulysses particle fluxes with those from the EPAM instrument on the ACE spacecraft (the HI-SCALE back-up instrument) have shown that it is common for the particle fluxes in the inner heliosphere following solar events to be distributed quite uniformly in heliolatitude. Thus, the Ulysses measurements, while taken over a range of heliolatitudes, can provide important statistical information that can be used to estimate the low energy radiation dosages and potential sputtering fluxes to planetary surfaces and to heliosphere spacecraft surfaces and solar arrays over a solar cycle.