

Cosmic ray observations at high latitude at solar minimum

R. Marsden

Research & Scientific Support Dept. of ESA, ESTEC, P.O. Box 299, 2200 AG Noordwijk, The Netherlands (Richard.Marsden@esa.int / Fax: +31 71 5654697)

The joint ESA-NASA *Ulysses* mission provided the first direct observations of cosmic rays at high heliographic latitudes during the first polar passes in 1994-95 near solar minimum. Contrary to expectations prior to launch, these observations showed that cosmic rays are transported rather easily in latitude, resulting in smaller-than-predicted latitudinal gradients. These observations have in turn led to a fundamental reappraisal of the underlying processes responsible for cosmic-ray modulation, in particular the role of perpendicular diffusion. During its second orbit of the Sun, *Ulysses* explored the high-latitude heliosphere near solar maximum and found equally compelling evidence for large-scale latitudinal transport of solar energetic particles. As *Ulysses* returns to the polar regions for the third time in 2006-2007, again near solar minimum, a number of important questions remain: will the polarity reversal of the Sun's magnetic field that occurred in 2000-01 lead to the expected changes in the latitudinal gradients of positively and negatively charged particles? Will the north-south asymmetry found in 1994-95 be present, and if so, will the offset still be to the south of the solar equator? In this paper, we will review the key observations from *Ulysses* during the previous high-latitude passes at solar minimum and compare them with the latest findings from the current phase of the mission as the spacecraft climbs once again to high latitudes in the approach to the next solar minimum.