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Observations of cosmic ray modulation from the Ulysses COSPIN HET and the IMP-8 CRNC instruments during Ulysses' climb from the heliographic equator to 80˚ south latitude in 2004-2007

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During Ulysses' pass over the solar polar regions in the solar minimum period 1994-95, comparison of observations from the Ulysses COSPIN High Energy Telescope and near-Earth from the IMP-8 CRNC instrument revealed small and positive latitude intensity gradients for several species of cosmic ray nuclei, qualitatively consistent with predictions given the orientation of the heliospheric magnetic field at that time. The observations also showed that intensity modulations impressed by the CIR structure near the equator persisted to the highest latitudes reached, and that the surface of symmetry of the 3-D modulation was shifted $\sim$10 degrees south of the heliographic equator. In the current solar polar pass, which began in November 2006, the polarity of the heliospheric magnetic field has reversed, leading to an expectation of negative latitude intensity gradients for nuclei. There might also be significant differences in the symmetry of the modulation and the persistence of recurrent low-latitude modulations to high latitude during this solar polar pass.

Since 2004 Ulysses has been climbing in latitude from the equator towards the south polar regions of the inner heliosphere, and during this same period solar activity has steadily decreased from near maximum levels toward solar minimum. Ulysses remained in the region swept by the heliospheric current sheet until early 2006 when, at a latitude of about 38˚ S, it entered the region dominated by the fast magnetically unipolar polar solar wind. Ulysses will reach a maximum southern latitude at 79.7 degrees in mid-February 2007 and then begin a fast latitude scan which will take it to the north polar regions by December, 2007. Observations through October 2006 (about 63

degrees south latitude for Ulysses) showed no convincing evidence for latitude gradients at energies above about 35 MeV/n for cosmic ray nuclei. The observations also showed a much more poorly organized CIR structure, and smaller intensity variations in response to the CIRs than observed in the similar phase of the previous solar cycle.

We will report results from ongoing observations through early 2007, including the time of Ulysses' maximum southern latitude, as we continue to investigate the 3-D solar modulation of cosmic rays in the new heliospheric magnetic polarity.

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