‘I’he Solar Wind in the Third Dimension

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The Ulysses spacecraft has been observing the properties of the high-latitude solar wind during a period of declining and minimum solar activity when the Sun displayed well-developed polar coronal holes. For 15 solar rotations, the spacecraft moved in and out of the solar wind from the equatorward extensions of the southern hole. On the inbound pass, between 5.4 and 4.4 AU, the corotating interaction regions showed well developed forward and reverse shocks propagating equatorward and poleward, respectively. Mapping back the trailing-edge flows to the Sun revealed the steep longitudinal gradients, or dwells, sometimes seen near the ecliptic; from the locations of the dwells, it is possible to calculate the extent of the non-radial flow of the wind between the inner corona and interplanetary space.

Poleward of -400, Ul ysses remained continuously within the flow from the polar coronal hole. The average properties of the plasma and field were similar to those observed previously at lower-latitudes when polar coronal holes had prominent equatorward extensions. It is possible to separate latitudinal from radial effects by comparing the inbound and outbound data. One interesting finding is the increasing width of the electron strahl with increasing latitude.

All was not quiet within the flow from the polar coronal hole, however. Coronal mass ejections were seen at latitudes as high as 60°. There were mini-high velocity streams with amplitudes as large as 100 km/s and with well developed compression regions on their leading edges. There were large-amplitude Alfvén waves with periods up to -12 hours. There were also pressure-balance structures where the plasma and magnetic pressures changed in opposite directions.

This paper will review the Ulysses plasma and field data available by the date of the conference.

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2. Invited

3. 111, Solar Wind Structure, Dynamics, and Involution

4. J. T. Gosling

5. Oral

6. No financial support required