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Solar Polar Explorer: A Mission to Explore the Polar Regions of the Sun

P. C. Liewer(1), K. P. Dere(2), B. E. Goldstein(1), R. A. Howard(2), C. M. Korendyke(2), D. Moses 2), N. Murphy(1), D. G. Socker(2), Y.-M. Wang(2)

(1) Jet Propulsion Laboratory, California Institute of Technology, Mail Stop 169-506, Pasadena, CA 91109

(2) Naval Research Laboratory, Solar Physics Branch, Washington D. C. 20375

Understanding the dynamic evolution of the solar magnetic field and corona requires observations from a perspective out of the ecliptic. The SOHO MDI experiment has demonstrated latitudinal gradients in the subsurface flows, but the convection at high latitudes is not well determined. Understanding the interior convection, and the generation and transport of the solar magnetic field, require magnetograph and Doppler imaging of the polar regions. The Ulysses mission has shown the need for polar coronal imaging and magnetograms for understanding the source of the solar wind, especially away from solar minimum. ESA's planned Solar Polar Orbiter is current envisioned a reaching about 40 degrees latitude which will provide limited high latitude viewing. While the upcoming Solar Terrestrial Relations Observatory (STEREO) mission will provide a great advance in the understanding of the three-dimensional structure of the corona and interplanetary medium, it will not be the optimal platform for studying the polar regions. It has long been recognized that a Solar Polar mission passing over the poles of the Sun is also needed to complete our understanding of the three dimensional structure of the corona and heliosphere.

Lightweight and compact instrumentation for solar polar observations has already been demonstrated technically. Here we present results of a recent study of a mission utilizing such instruments which uses a Jupiter gravity assist to achieve a Ulysses-like orbit passing over the poles of the Sun. In such orbits, the amount of time spent viewing the polar regions is limited; orbits with closer perihelia provide less viewing time, but higher resolution imaging. Several options will be discussed.

Prefer Oral Presentation