

Parker Solar Probe: New Views of the Nascent Solar Wind

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The magnetic field is fundamental to solar activity and shapes the inter-planetary environment, as shown by the full three dimensional monitoring of the heliosphere provided by measurements from many past and present interplanetary and remote sensing spacecraft. Magnetic fields are also the source for coronal heating and the very existence of the solar wind; produced by the sun's dynamo and emerging into the corona, magnetic fields become a conduit for waves, act to store energy, and then propel plasma into the Heliosphere in the form of Coronal Mass Ejections (CMEs). Magnetic fields are also at the heart of the generation and acceleration of Solar Energetic Particle (SEPs) that modify the space weather environment of the Earth and other planets.

Parker Solar Probe (PSP) was launched in August 2018 to carry out the first in situ exploration of the outer solar corona and inner Heliosphere. Direct measurements of the plasma in the closest atmosphere of our star should lead to a new understanding of the questions of coronal heating, solar wind acceleration, and the generation, acceleration and propagation of SEPs.

In this lecture I will start with an introduction to our present knowledge of the magnetized solar corona and wind before describing the PSP scientific objectives, orbit, and instrument suites, and showing results from the first three orbits. Emphasis will be on how PSP will confirm or falsify present wind models as well as the potential new discoveries stemming from the first exploration of the space inside the orbit of Mercury. I will also discuss how synergies with Solar Orbiter might lead us to accurately understand the state of the solar wind all the way from the corona into interplanetary space, a stepping stone for understanding the dynamics of active magnetized plasmas throughout the universe.