

Stream Interaction Regions in the Inner Heliosphere: Insights from the First Four Orbits of Parker Solar Probe

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The first four orbits of Parker Solar Probe (PSP) consists of many observations of stream interaction regions (SIRs), which form when fast solar wind streams overtake slower solar wind. While it is known that SIRs accelerate ions in the heliosphere and can trigger geomagnetic storms, the temporal and radial evolution of SIRs is still an active topic of research. During the first four orbits of PSP, SIRs were observed by PSP at small heliospheric distances, as well as at 1 au by the Advanced Composition Explorer (ACE), Wind, and Solar Terrestrial Relations Observatory (STEREO) missions. These SIRs are observed not only at different heliospheric distances, but also at different points in the temporal development of the stream interface. Through analyzing the various SIRs together, insight can be gained in regards to the spatial and temporal evolution of SIR characteristics, as well as to the mechanisms of particle acceleration and transport along the SIR interface. The general characteristics of SIRs observed by PSP during the first four orbits are presented, and an in-depth comparison of a few of the SIR events is conducted to further analyze the evolution of SIR streams in the inner heliosphere. These observations show examples of a fast solar wind stream steepening into an SIR, with evidence of locally accelerated particles via compressive mechanisms at the interface distinguishable from observations of particles likely accelerated at shocks formed at larger heliospheric distances.

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