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Anticipated Breakthroughs in SEP understanding with the Parker Solar Probe

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Coronal mass ejections and solar flares release huge quantities of energized matter, magnetic fields and electromagnetic radiation into space. The high-energy particles, known as solar energetic particles or SEPs, present a serious radiation threat to human explorers living and working outside low-Earth orbit and to technological assets such as communications and scientific satellites in space. Our current understanding of SEPs is hampered because the near-Earth observations are influenced by multiple effects such as the identity of the suprathermal seed populations, the mechanisms by which these seed particles are selected and accelerated to higher energies, and lastly, how interplanetary turbulence and large-scale solar wind structures affect their transport to Earth orbit. One of the major goals of NASA's Parker Solar Probe (PSP) mission is to determine the mechanisms that accelerate and transport high-energy particles from the solar atmosphere out into the heliosphere. PSP will revolutionize our understanding of SEPs by making the first-ever direct measurements of key properties such as intensities, energy spectra, composition, and angular distributions of both the low-energy suprathermal source populations as well as the more hazardous, higher energy particles in the near-Sun environment where the acceleration takes place. This talk discusses key areas in which PSP will provide ground-truth observations that will serve as definitive tests for current SEP models.