Research Statement

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I am a second-year graduate student in the EPSS Department at UCLA, with an interest in contributing to the understanding of key phenomena in the heliosphere like magnetic discontinuities. Magnetic discontinuities, characterized by localized, transient alterations in the magnetic field, play a crucial role in in processes such as efficient *plasma acceleration* and the generation of *plasma instabilities* (magnetic reconnection) associated with discontinuity currents. To this end, I leverage a multifaceted approach that encompasses spacecraft observations, numerical simulations, the development of analytical tools and the analysis of extensive datasets to study these phenomena.

Research experience

My research journey has encompassed several key projects:

1. analyzing the spatial evolution of solar wind discontinuities in the outer heliosphere with Juno spacecraft data by differentiating the temporal effect (correlated with solar activity) and spatial variations (correlated with radial distance);
2. integrating observations from multiple spacecraft missions (Van Allen Probes, ERG/ARASE, MMS, GOES, ELFIN, POES) to explore the dynamics of relativistic electrons in the magnetosphere with series of strong electron and ion injections from the plasma sheet and strong electron precipitation; and
3. employing particle-in-cell simulations to investigate the interaction between the solar wind and lunar crustal magnetic anomalies.

Future research plans

Looking forward, my research will concentrate on elucidating the influence of magnetic discontinuities on the acceleration of solar wind particles. Utilizing data from the Parker Solar Probe (PSP) to examine the spatial distribution of discontinuities in the inner heliosphere represents a significant part of this work. By synthesizing PSP observations with data from additional spacecraft, I aim to trace the evolution of these discontinuities from their solar origins to the outer reaches of the heliosphere. Subsequent numerical simulations, particularly test-particle simulations incorporating realistic discontinuity parameters, will enable a deeper understanding of solar wind particle dynamics in the presence of discontinuities.

Relevence of the school to my career goals

The thematic focus of the school on universal processes in heliophysics aligns perfectly with my research interests, since discontinuities and particle acceleration are ubiquitous in the heliosphere. Participating in this program presents a unique chance to engage with the latest advancements in the field and to network with leading experts and fellow researchers. I am especially drawn to the *comparative* dimension of the school's curriculum, which promises to enrich my research perspective by highlighting the commonalities and distinctions among heliospheric processes across different regions. This comparative analysis is invaluable, as it will broaden my comprehension of the phenomena under study and enhance the contextual framework of my research endeavors.