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Oral
(Invited Talk)
In this talk, we aim to provide an overview of current models of the inner heliosphere which describe the global structure of the solar wind and propagation of interplanetary coronal mass ejections (CMEs). Existing models typically begin beyond the Alfven surface in the solar wind, approximately 20 RSun, and extend up to 1 AU. These models rely on boundary conditions provided by coronal models, described either by full magnetohydrodynamics (MHD) or empirical methods.
To simulate evolution of ICMEs in the background solar wind, inner heliosphere models must incorporate a description for a CME structure. The most common approach has been to model a CME hydrodynamically, allowing for insights into the CME's time-of-arrival, as well as the spatial and temporal evolution of the CME-driven shock and sheath. However, recent advancements have enabled the inclusion of the CME's internal magnetic field within the models, offering the opportunity to study the magnetic structure's evolution in the ambient solar wind. We will present and compare these different methodologies for modeling CMEs in the inner heliosphere. We will emphasize the utility of these models in generating synthetic data for testing flow tracking algorithms and mission data pipelines, particularly in preparation for PUNCH observations.
Furthermore, we will showcase the recent progress in modeling ICMEs in the inner heliosphere using the GAMERA and Gibson-Low models including a high-resolution simulation which reveals wealth of mesoscale structures formed in the interaction of CMEs with the background solar wind.
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