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Oral
(Invited Talk)
Mesoscale structures in the solar wind (those larger than kinetic scales and smaller than global structures such as corotating interaction regions) are created in two general ways: first, those that are of a solar origin, formed in the solar atmosphere, and second, those formed through processing en route as the solar wind advects outward. For solar-generated structures, spatial structures such as plumes and supergranules impose mesoscale structure in the solar wind, while time dynamic phenomena such as magnetic reconnection and waves inject mesoscale structures into the solar wind. Complexity arises from the interaction between the imposed/injected structures that survive from the Sun with turbulence and other dynamical evolution. Understanding the source and evolution of solar wind mesoscale structures is important because this understanding contains information on how the Sun forms the solar wind and constrains the physics of turbulence and other dynamical processes. Furthermore, we describe the importance of mesoscales in the solar wind as the ground state of space weather, often driving dynamics in Earth's magnetosphere, even on days when there are no large space weather events. Additionally, mesoscale solar wind structures are the structure through which larger space weather events propagate, and their existence upstream of large space weather events 'precondition' Geospace, determining the state of the magnetosphere and radiation belts when large space weather events impact Earth. We describe how the Polarimeter to UNify the Corona and Heliosphere (PUNCH) mission, with its high temporal and spatial resolution and unprecedented coverage of the inner heliosphere, will unravel the complexity of mesoscale structures by measuring and tracking their characteristics through the inner heliosphere.
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