Steven R.
Cranmer
University of Colorado Boulder
Rohit Chhiber (U. Delaware, GSFC),
Chris R. Gilly (SwRI, CU Boulder),
Iver H. Cairns (U. Sydney),
Robin C. Colaninno (NRL),
David J. McComas (Princeton),
Nour E. Raouafi (APL),
Arcadi V. Usmanov (U. Delaware, GSFC),
Sarah E. Gibson (NCAR/HAO),
Craig E. DeForest (SwRI)
Oral
(Invited Talk)
The solar wind is the extension of the Sun's hot and ionized corona, and it exists in a state of constant expansion into interplanetary space. The radial distance at which the wind's outflow speed exceeds the phase speed of Alfvenic and fast-mode MHD waves is called the Alfven surface. This is a singular point beyond which most fluctuations in the plasma and magnetic field cannot propagate back down to the solar surface. In this presentation, we review the properties of the Alfven surface and discuss its importance in models of solar wind acceleration, angular momentum transport, MHD waves and turbulence, and the stability of closed coronal loops. We also review the results of simulations and data analysis techniques that aim to determine the radial location of the Alfven surface. Combined with recent perihelia of Parker Solar Probe, these studies seem to indicate that the Alfven surface spends most of its time at heliocentric distances between about 10 and 20 solar radii. It is becoming increasingly apparent that this region of the heliosphere is sufficiently turbulent that there often exist multiple (stochastic and time-dependent) crossings of the Alfven surface along any radial ray. Thus, in many contexts, it is more useful to make use of the concept of a frothy "Alfven zone" rather than a single Alfven radius. Lastly, we review how the Polarimeter to UNify the Corona and Heliosphere (PUNCH) will measure the properties of the Alfven surface and provide key constraints on theories of solar wind acceleration.
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