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Oral
(Invited Talk)
The traditional attitude of the coronagraph community toward the observation of the scattered light by dust (i.e. the F-corona) was that it was constant and therefore not interesting. Thus, we developed techniques to remove the much brighter signal to reveal what we were really interested in – the electron scattering (i.e. the K-corona). But that changed (in my mind) in anticipation of the launch of the Parker Solar Probe, when we realized that Parker would be taking the observer to a region of space eliminating almost 1 AU of dust and that we might be seeing things that were quite different than from 1 AU. We were hoping to resolve the 1929 prediction (still unproven) that all stars have a dust free zone around it. The properties of the F-corona and its extension called the Zodiacal Light, had not been characterized since the 1970's with the Helios data. We needed to establish a baseline of observations from 1 AU so that we could recognize anything that was different. So, we embarked on a study using the STEREO SECCHI HI-1 data which has similar elongation angles, and thus scattering angles, to the Parker WISPR instrument. We also were going to have a problem in developing the background F-model, in that we could not use the techniques being used by LASCO and SECCHI, because the motion of the S/C was going to be much faster than what it is at 1 AU. Guillermo Stenborg took the challenge and in a series of 5 papers (2017-2018) did develop a technique to determine the background and established a baseline set of 1 AU observations, finding that the F/ZL brightness distribution is indeed very constant over 6 years of data, but that constancy enabled some surprising results. First, being at the ascending and descending nodes of the zodiacal cloud symmetry axis was different than at other ecliptic longitudes. Secondly, at closer distances to the Sun, the inclination and the ascending node of the zodiacal cloud tended toward circularity, apparently due to the Poynting-Robertson effect (JxB). Third, a possible dust ring was found in Mercury's orbit – one had been detected in Venus' orbit previously. With its increased sensitivity, full 360o coverage and high cadence, Punch should be able to make significant progress in a number of areas. One that has been debated for years is an "East-West" asymmetry. This has been clearly seen by Parker and seems to be due to the locations of the solar system barycenter and Jupiter. We will quickly discuss the Parker results and will present a set of dust science objectives that PUNCH can address.
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