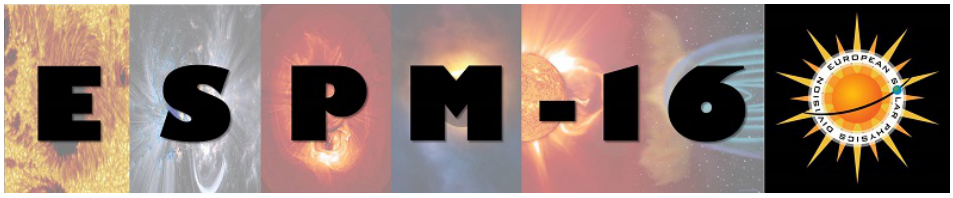

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Statistical study of Stream Interaction Regions at 1 and 1.5 AU

Wednesday, 8 September 2021 11:52 (13 minutes)

We study the evolution of stream and co-rotating interaction regions (SIRs and CIRs) as they propagate from Earth to Mars. We incorporate solar wind plasma and magnetic field data from the OMNI database and the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. Additionally, we use images from the Solar Dynamics Observatory (SDO). The investigation covers the declining phase of solar cycle 24, resulting in a clean dataset of 146 events at 1 AU and 126 events at 1.5 AU. We perform a superposed epoch analysis (SEA) of bulk speed, number density and temperature, as well as magnetic field magnitude and total perpendicular pressure. We conduct an in-depth analysis for a subset of events during the opposition phases of the two planets. In-situ properties of SIRs are linked to the extension of their source coronal holes (CHs) for this period of time. The SEA reveals a broadening of SIRs at the wave crest by 17% for speed, and by about 45% for both magnetic field magnitude and total perpendicular pressure. The amplitudes of the normalized solar wind parameters increase monotonically from Earth to Mars, except for that of plasma temperature, which shows a decrease. We arrive at similar correlations for streams at both planets during the opposition phases. There is a stronger linkage of maximum solar wind speed to the latitudinal extension of CHs than to their longitudinal extent. We find that the occurrence rate of fast forward shocks increases by a factor of three from Earth to Mars.

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