Simulation of Geo-Effective Small-to-Mesoscale Solar Wind Structures as Viewed by PUNCH.
Chip
Manchester
University of Michigan
Nishtha Sachdeva, University of Michigan
Matti Ala-Lahti, University of Michigan
Emilia Kilpua, University of Helsinki
Shirsh Soni, University of Michigan
Zhenguang Huang, University of Michigan
Hongfan Chen, University of Michigan
Aniket Jivani, University of Michigan
Bart van der Holst, University of Michigan
Adam Szabo, NASA Goddard Space Flight Center
Mojtaba Akhavan-Tafti, University of Michigan
Oral
We investigate the interaction of a coronal mass ejection (CME) with a corotating interac-tion region (CIR) that results in the intensification of magnetic field and formation of ge-oeffective meso-scale flux ropes. We simulate the CME-meso-scale system with the Alfven Wave Solar Atmosphere Model (AWSoM) by first producing the background solar wind con-dition for solar maximum conditions occurring September 2014. The CME is initiated from the originating active region with a Gibson-Low magnetic flux rope with parameters chosen to simulate an energetic event. With the use of high-resolution grids, we capture magnetic reconnection within the erupting flux rope as it impacts the CIR leading to the formation of meso-scale flux ropes containing sufficiently strong magnetic fields (~40 nT) to be geoeffec-tive. We provide wide-angle synthetic PUNCH images to show the viability of capturing me-so-scale structures in the inner heliosphere. We also present the magnetic field and plasma quantities are extracted in the location of four virtual probes arranged in a tetrahedral con-figuration with an average spacecraft separation of 1 Rs at Lagrange point L1. The constella-tion, corresponding to Space Weather Investigation Frontier (SWIFT) mission, is shown to resolve the spatial characteristics and temporal evolutions of magnetic reconnection at and small- to meso-scale current sheet structure within the ICME.
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