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Oral
(Invited Talk)
Coronal Mass Ejections (CMEs) are the major drivers of space weather events. For accurate prediction of space weather, we need to be able to model, and analyze, CMEs and their propagation through the heliosphere. The upcoming PUNCH mission will observe these with an unprecedented field of view and in both polarized and unpolarized white light (pB and tB). From comparative pB and tB analysis it is possible to deduce the location of the center of mass along each line of sight in the image. In other words, pB/tB analyses will give us insight at the structure of plasma inside the CME, and a better estimate of the CME position as it travels through space.

In this talk, we explore several ways of using PUNCH data for CME studies. These include using these data to inform density input in our simulations to help track arrival time; using them to track CME propagation; and analyzing the 3D density structure inside CMEs.

For the tracking and 3D density analysis, we use a community testbed, the "CME Challenge" dataset available to the community via the PUNCH website. It contains simulated observations of several different CMEs, emerging into a steady-state solar wind. The MHD solutions use the GAMERA code, in which CMEs are modeled by a density enhancement with a magnetic structure inspired by Gibson & Low spheromac solutions, emerging and expanding at speeds consistent with Gibson & Low solutions.

We also discuss several programs that have been designed for forecasting space weather aspects of CMEs using PUNCH data. These include 3D CME detection and tracking programs, 3D CME reconstructions, forward modeling of CMEs tracked through the PUNCH NFI and WFI fields, and modeling using the ENLIL code.
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