



Contribution ID: 348

Type: Talk

Deriving CME volume and density from remote sensing stereoscopic data

Friday, 10 September 2021 09:00 (15 minutes)

Using combined STEREO-SOHO white-light data, we present a method to determine the volume and density of a coronal mass ejection (CME) by applying the graduated cylindrical shell model (GCS) and deprojected mass derivation. Under the assumption that the CME mass is roughly equally distributed within a specific volume, we expand the CME self-similarly and calculate the CME density for distances close to the Sun (15–30 Rs) and at 1 AU. The procedure is applied on a sample of 29 well-observed CMEs and compared to their interplanetary counterparts (ICMEs). Specific trends are derived comparing calculated and in-situ measured proton densities at 1 AU, though large uncertainties are revealed due to the unknown mass and geometry evolution: i) a moderate correlation for the magnetic structure having a mass that stays rather constant ($cc \approx 0.56 - 0.59$), and ii) a weak correlation for the sheath density ($cc \approx 0.26$) by assuming the sheath region is an extra mass - as expected for a mass pile-up process - that is in its amount comparable to the initial CME deprojected mass. High correlations are derived between in-situ measured sheath density and the solar wind density ($cc \approx -0.73$) and solar wind speed ($cc \approx 0.56$) as measured 24 hours ahead of the arrival of the disturbance. This confirms that the sheath-plasma stems from piled-up solar wind material. While the CME interplanetary propagation speed is not related to the sheath density, the size of the CME may play some role.

Student poster?

Do you want to be considered for a student poster prize?

Primary authors: TEMMER, Manuela (Institute of Physics); Dr DUMBOVIĆ, Mateja (Hvar Observatory, Faculty of Geodesy, University of Zagreb); VRŠNAK, Bojan (Hvar Observatory, Faculty of Geodesy, University of Zagreb, Croatia); Dr SACHDEVA, Nishtha (Climate and Space Sciences and Engineering Department, University of Michigan, USA); HEINEMANN, Stephan G. (Max-Planck-Institute for Solar System Research); Dr DISSAUER, Karin (NorthWest Research Associates, Boulder, USA); Dr SCOLINI, Camilla (UNH, USA); ASVESTARI, Eleanna (Department of Physics, University of Helsinki, Finland); Prof. VERONIG, Astrid (Kanzelhöhe Observatory for Solar and Environmental Research & Institute of Physics, University of Graz); HOFMEISTER, Stefan (stefan.hofmeister@columbia.edu)

Presenter: TEMMER, Manuela (Institute of Physics)

Session Classification: Plenary 7

Track Classification: Session 4 - From Radio to Gamma Rays: Near-Sun Manifestations and Triggering of Solar Flares and Coronal Mass Ejections