

Evidence of a complex structure within the 2013 August 19 CME. ICME radial and longitudinal evolution in the heliosphere.

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Abstract

Context: Late on 2013 August 19, a coronal mass ejection (CME) erupted from an active region located near the far-side central meridian from Earth's perspective. The event and its accompanying shock was remotely observed by the STEREO-A, STEREO-B and SOHO spacecraft. The interplanetary (IP) counterpart (ICME) intercepted MESSENGER near 0.3 au, and both STEREO-A and STEREO-B, near 1 au, which were separated by 78 degrees in longitude. **Aims:** The main objective of this study is to follow the radial and longitudinal evolution of the ICME throughout the heliosphere, and to examine possible scenarios for the different magnetic flux- rope (MFR) signatures observed on the solar disk, and measured at the locations of MESSENGER and STEREO-A, separated by 15 degrees in heliolongitude, and at STEREO-B, which detected the ICME flank. **Methods:** Solar disk observations are used to estimate the 'MFR type' and the graduated cylindrical shell model is used to reconstruct the CME in the corona. The analysis of in-situ data, namely, plasma and magnetic field, is used to estimate the global IP shock geometry and to derive the MFR type at different in-situ locations. The elliptical cylindrical analytical model is used for the in-situ MFR reconstruction. **Results:** The MFR structure detected at STEREO-B belongs to the same magnetic structure detected at MESSENGER and STEREO-A. The different helicity deduced at STEREO-B, might be due to the spacecraft intercepting one of the legs of the MFR, while STEREO-A and MESSENGER are crossing through the core of the structure. The opposite polarity measured at MESSENGER and STEREO-A arises because the two spacecraft measure a curved, highly distorted and rather complex MFR topology. The ICME may have suffered additional distortion in its evolution in the heliosphere, resulting in different expansion and arrival time of the IP shock flanks at 1 au.

Evidence of a complex structure within the 2013 August 19 Coronal Mass ejection (CME)

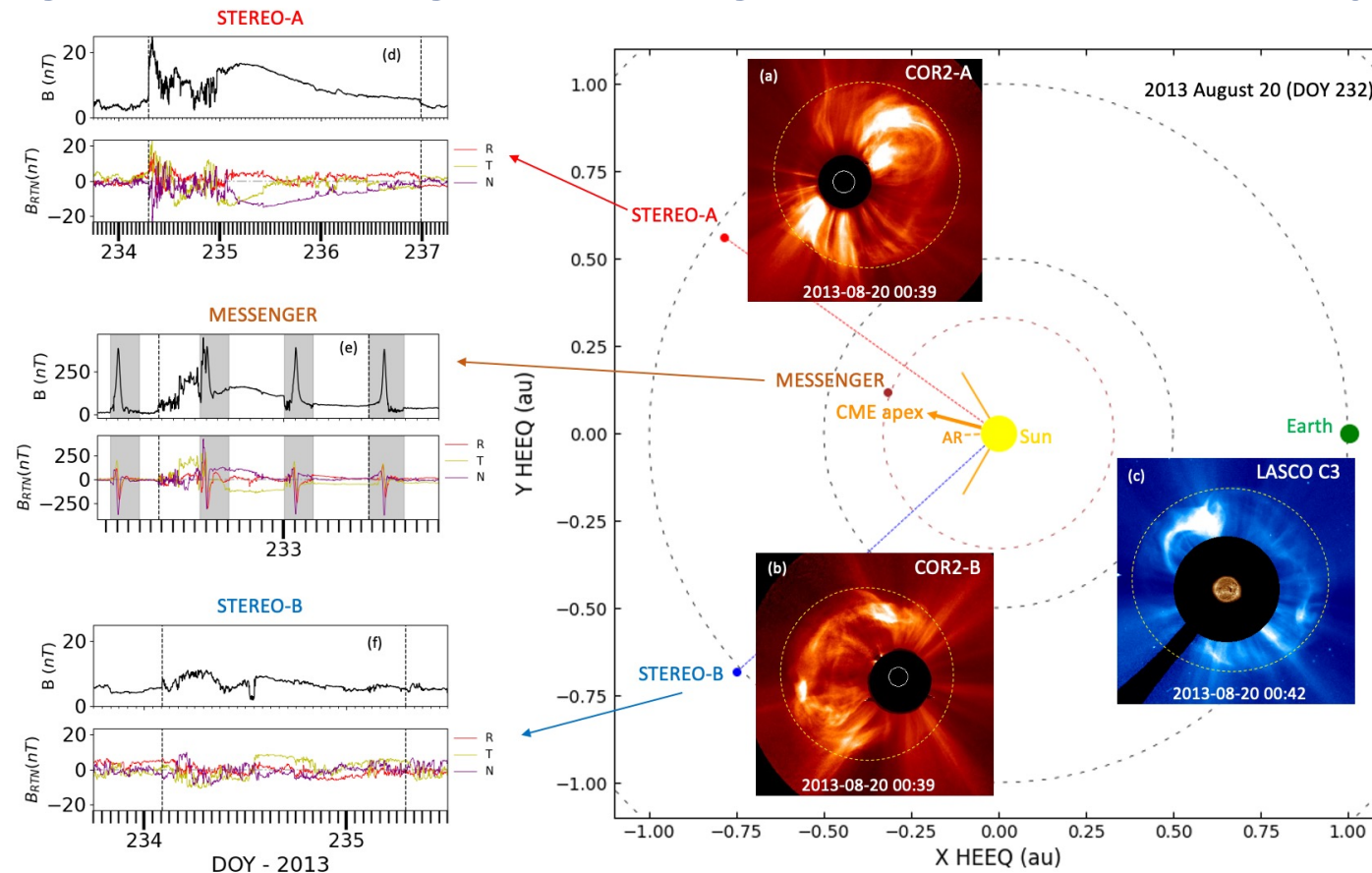


CME related to an 'Unusual Solar Energetic Particle Event'

Rodríguez-García et al, 2021

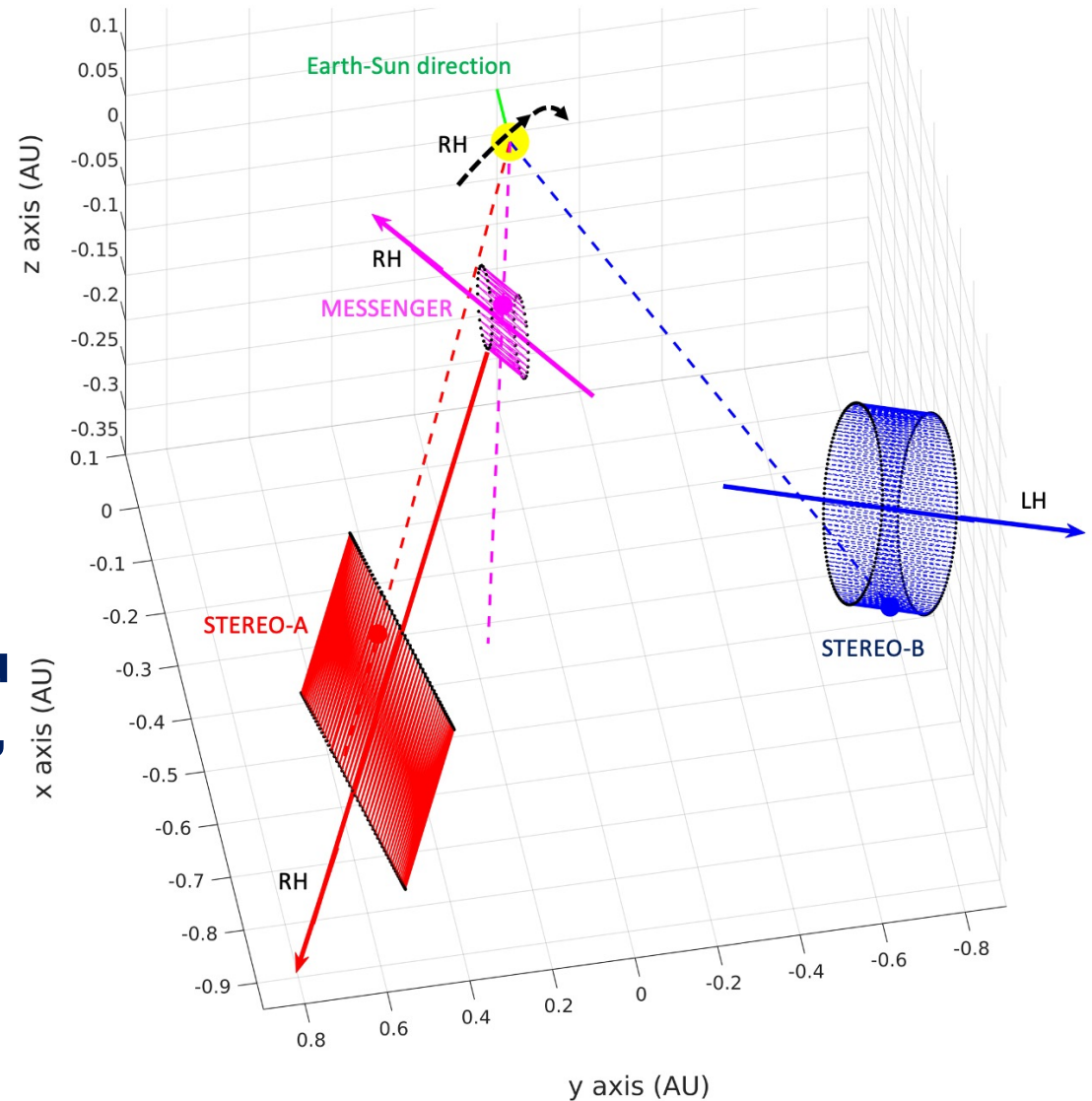
<https://www.aanda.org/articles/aa/abs/2021/09/aa39960-20/aa39960-20.html>

Motivation: Do the different magnetic field ropes (MFR) measured in situ, spanning 78 degrees in heliolongitude, belong to the same interplanetary CME (ICME)?

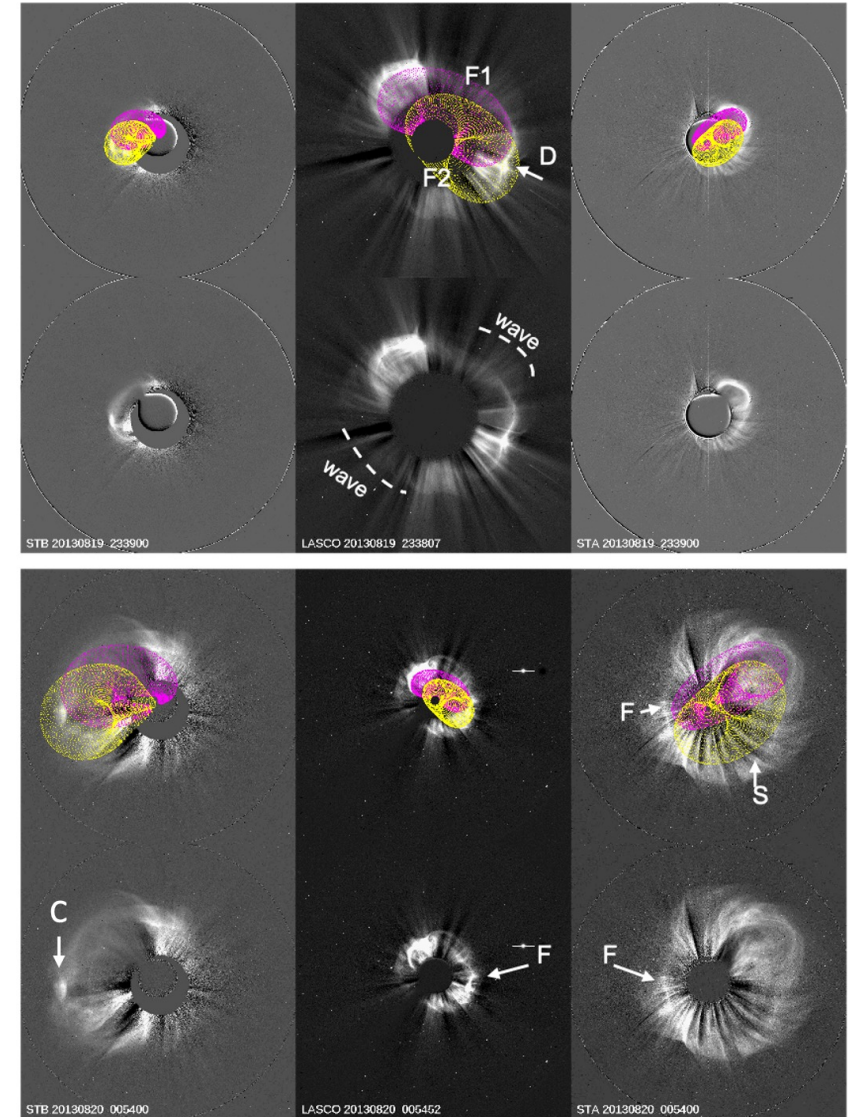
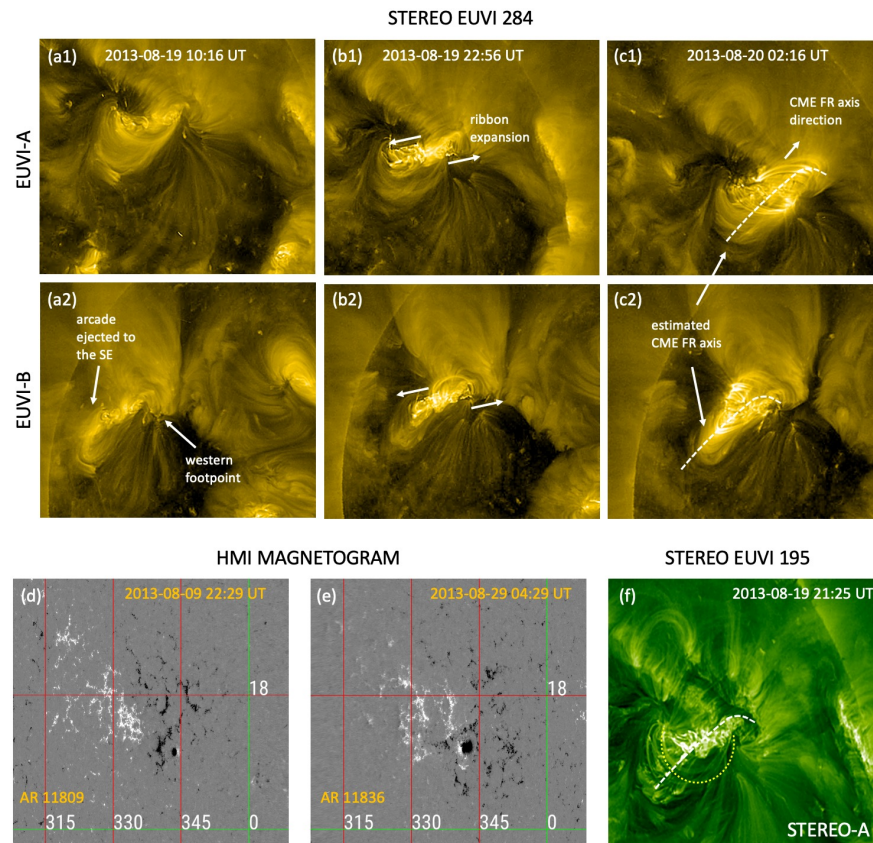


★ **STEREO-B intercepts the west leg of the ICME while MESSENGER and STEREO-A are crossing through the core of the ICME.**

★ **The different MFR orientations observed in situ might be related to a curved, highly distorted and rather complex magnetic field topology.**



- ★ Dual chirality: kink instability study/flux emergence simulation
- ★ Reconstruction of the MFR taking distortion into account



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