

3 NASA Satellites Create a 3-D View of Solar Eruption

Coronal mass ejections (CMEs) expel magnetized plasma from the Sun, propelling a wave of high energy particles towards Earth at extreme speeds. As this shockwave of energy develops and accelerates, it can spark space weather events, such as geomagnetic storms and increased aurora activity.

Research published in the *Journal of Space Weather and Space Climate* has taken data from three spacecraft – ESA/NASA’s Solar and Heliospheric Observatory (SOHO) and NASA’s twin Solar and Terrestrial Relations Observatory (STEREO) satellites – to fit their models of the shape of both the CME (“croissant”) and its expanding (“ellipsoid”) shock. Two CMEs were studied: one in March 2011 and another in February of 2014. Each spacecraft alone could not provide sufficient data to model the shocks, but with three sets of eyes on two CME events, scientists could infer the 3-D view of both CME and shock.

Using these models to reconstruct the CME’s journey through space, scientists were able to deduce important pieces of information for space weather forecasting – such as the plasma density, speed, and strength of the shock. Their work confirmed long-held theoretical predictions of a strong shock near the CME nose and a weaker shock at the sides. This information will improve our ability to assess the dangers CMEs present to astronauts and spacecraft.



The 3D view modelled on the left confirmed long-held theoretical predictions of a strong shock near the CME nose and a weaker shock at the sides. The pink lines show the CME structure and the yellow lines show the structure of the shock.