STEREO Reveals Solar Storm Related to Failure Aboard Communications Satellite

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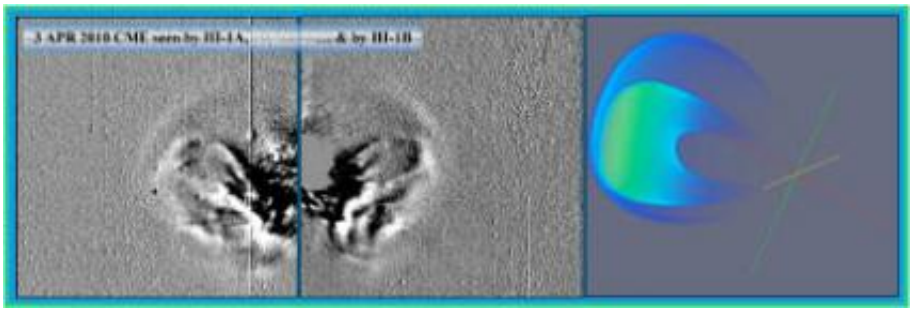

The left and center panels are NASA STEREO images of the April 3, 2010 solar coronal mass ejection about eleven hours after its inception, as viewed from STEREO-A and STEREO-B respectively. The right panel is a three-dimensional reconstruction of the morphology of the event, consisting of a flux rope with a shock wave driven in front of it [Brian Wood, NRL].

(PhysOrg.com) -- Observations from NASA's twin Solar Terrestrial Relations Observatory (STEREO) spacecraft have allowed Naval Research Laboratory scientists to see recent solar activity that may have produced the first casualty of the new solar cycle #24. A coronal mass ejection from April 3, 2010 apparently resulted in a critical failure on the Galaxy 15 communications satellite, as reported by Space News on April 20.

Coronal mass ejections, or CMEs, are powerful eruptions of plasma and magnetic energy from the Sun's outer atmosphere, or corona. When

these sudden outbursts are directed toward Earth, they can have both breathtakingly beautiful and potentially damaging effects.

The recent sequence of space weather events started with a moderate solar flare and prominence eruption from solar active region 1059, at 9:04 UT on April 3, 2010. A CME associated with this eruption was subsequently observed by NRL's Space Science Division (SSD) developed solar ultraviolet imagers, white light coronagraphs, and heliospheric imagers onboard the NASA STEREO satellites, explains NRL's Brian Wood.

A "halo" CME was concomitantly observed by the NRL-developed LASCO coronagraph on the SOHO spacecraft that is located at the Lagrangian L1 point between the Sun and the Earth, an appearance indicating that the CME was headed straight for our planet. The imagers on the two STEREO spacecraft (STEREO-A and STEREO-B), orbiting roughly 70° ahead and behind Earth respectively, were able to track this geoeffective CME continuously from its inception at the surface of the Sun all the way to Earth, which the CME struck on April 5, 2010.

The unique lateral views provided by STEREO were ideal for studying the kinematics and morphology of the developing event, explains Dr. Russell Howard, principal investigator for SECCHI, aboard STEREO. The accompanying figure shows stereo imagery from the heliospheric imagers on the two STEREO spacecraft approximately 11 hours after its inception, when it was about 50 solar radii from Sun-center. These and other STEREO images enabled a three-dimensional reconstruction of the CME morphology, consisting of a croissant-shaped "flux rope" structure with a shock wave driven in front of it.

The STEREO images suggest that the CME was traveling at a velocity of ~1000 km/s close to the Sun, and that it gradually decelerated to ~700 km/s by the time the CME impacted the Earth. Consistent with these

measurements, in-situ instruments on board the NASA ACE spacecraft, also at L1, observed at 7:51 UT on April 5 an interplanetary shock traveling with a solar wind velocity of ~750 km/s. A moderate geomagnetic storm was induced by this geoeffective CME after the shock hit the Earth, shrinking the subsolar magnetopause from ~10 Earth radii to ~6.5 Earth radii.

Provided by Naval Research Laboratory