NATURE | NEWS

Solar eruptions combine to cause super storms

Collision of successive ejections found to cause extreme space weather.

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Merging space storms

The NASA satellite STEREO-A, which orbits the Sun just slightly closer than does Earth, was in the direct path of a solar storm.

Ref. 1

The interaction of three huge ejections of particles and magnetic field from the Sun was behind a massive solar storm in interplanetary space in 2012, physicists say. The findings could help to improve space weather forecasting on Earth.

The coronal mass ejections (CMEs) came from the same active region on the then-far side of the Sun, one erupting on 19 July 2012 and two launching four days later, about 15 minutes apart. The resulting event, had it been aimed directly at Earth, would have created the most severe geomagnetic storm since the beginning of the space era, say physicists. Such an event would have probably short-circuited power grids and disrupted satellites.

By the time they hit Earth, most CMEs have speeds and magnetic field strengths comparable to the normal streams of charged particles from the Sun we experience every day. Publishing online in *Nature Communications*[1] today, Ying Liu, a physicist at the National Space Science Center in Beijing, and his colleagues show how in this case, interaction between successive CMEs instead enhanced them into a 'superstorm' — with five times the speed and more than ten times the magnetic field strength of a typical CME at Earth's orbit.

The team used data from space-based observatories to study the event, including images from NASA's STEREO-A spacecraft, which experienced the storm head-on (see video). They found that its fast pace was down to the initial ejection clearing a region for the subsequent two CMEs to travel through. As these interacted close to the Sun, then travelled fast, they were not allowed to expand, which boosted their magnetic field strength, say the authors.

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References

1. Liu, Y. D. *et al*. *Nature Commun.* http://dx.doi.org/10.1038/ncomms4481 (2014).