Severe Magnetic Storm

June 2, 2025 12:00 Eastern Time

A severe magnetic storm commenced suddenly at 01:42 Eastern on June 1, 2025 with the arrival, at Earth of a coronal-mass ejection (CME) from the Sun; a second CME arrived 15:20 Eastern on June 1. The storm is still ongoing, but appears to be past a maximum strength on 06:07 Easter. According to the [NOAA Space Weather Prediction Center](https://swpc.noaa.gov) geomagnetic disturbance index, which classifies storms on a scale from G1 (minor)-G5 (extreme), the storm attained a G4 (severe) level of disturbance.

Storms of this intensity can interfere with aeromagnetic surveys, directional drilling for oil and gas, satellite operations, GPS positioning and timing signals, and over-the-horizon radio communication, but they do not usually cause interruption of electric-power-transmission.

Aurorae were seen as far south as the Gulf of America.

In comparison to this storm, that of May 10-12, 2024 attained a G5 level of disturbance, and the recent storm of January 1, 2025 attained a G4 level. Since we are presently at about maximum in the solar cycle, there is a high chance of several additional G4 storms occurring in the next year or two. There is also a good chance that another G5 storm will occur.

The storm was monitored at USGS magnetometer stations. Geomagnetic declination at College (Fairbanks), Alaska, varied by 3.4 degrees, enough to be seen on a compass.

A conventional measure of magnetic-storm strength is the (low-latitude) disturbance index known as Dst. This index measures disturbance relative to quiet, non-stormy conditions. The USGS calculates a real-time Dst index useful for diagnosing the state of space weather during magnetic storms.

Soon after this storm commenced, USGS Dst increased to 40 nT, indicating the development, in response to solar-wind pressure, of electric currents on the magnetopause (outer boundary of the magnetosphere). This was followed by a gradual descent into the storm's main phase, and amplification of the magnetospheric ring current, as indicated by Dst declining to negative values. Dst attained a minimum of -122 nT at 06:07 Eastern on June 1. The Kyoto World Data Center Dst index also attained -120 nT. For comparison, the storm of May 10-12 attained a Dst of -422 nT.

The great storm of March 1989, which caused widespread interference to technological systems around the world, including power systems in the U.S. and a power blackout in Québec, attained a Dst value of -589 nT. The Carrington superstorm of September 1859, which caused widespread interference to telegraph systems, attained a Dst value of about -900 nT.

The USGS Geomagnetism Program operates 14 magnetic observatories across the U.S. and territories; the Program collaborates with the Albuquerque Seismological Laboratory in operation of variometers across CONUS; and it supports magnetotelluric surveys. The Geomagnetism Program disseminates magnetic data in real-time to governmental (both

civilian and military), academic, and private institutions. Program scientists conduct research into the nature of geomagnetic variations for purposes of scientific understanding and hazard mitigation.

A recent factsheet on the solar cycle, geology, and geoelectric hazards for power grids can be accessed here: https://doi.org/10.3133/fs20243036

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