

# Geomagnetic data reveal unusual nature of recent solar minimum

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Since the mid-1800s, scientists have been systematically measuring changes in the Earth's magnetic field and the occurrence of geomagnetic activity. Such long- term investigation has uncovered a number of cyclical changes, including a signal associated with 27-day solar rotation.

This is most clearly seen during the declining phase and minimum of each 11-year [solar cycle](#), when the Sun's magnetic dipole is sometimes tilted with respect to the Sun's [rotational axis](#). With the Sun's rotation and the emission of [solar wind](#) along field lines from either end of the solar magnetic dipole, an outward propagating spiral-like pattern is formed in the solar wind and the interplanetary magnetic field that can drive 27-day, and occasionally 13.5-day, recurrent geomagnetic activity.

Recurrent geomagnetic activity can also be driven by isolated and semipersistent coronal holes, from which concentrated streams of solar wind can be emitted.

During the most recent [solar minimum](#), which took place from 2006 to 2010, however, several researcher groups noticed 6.7-day and 9-day recurrent changes in geomagnetic activity, and similar patterns in the interplanetary magnetic field, and the solar wind. Using modern data covering the previous two solar minima, these higher-frequency occurrences were judged to be unusual.

Love et al. analyzed historical geomagnetic activity records from 1868 to 2011 and find that the 6.7-day and 9-day recurrent changes were actually

unique in the past 140 years.

They suggest that the higher-frequency changes in geomagnetic activity are due to an unusual transient [asymmetry](#) in the solar dynamo, the turbulent, rotating plasma deep within the sun which generates the magnetic field.

**More information:** Geomagnetic detection of the sectorial solar magnetic field and the historical peculiarity of minimum 23-24  
*Geophysical Research Letters*, [doi:10.1029/2011GL050702](https://doi.org/10.1029/2011GL050702) , 2012

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