Could the summer 2025 earthquake awakening be provoked by magnetic storms?

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Emily Warrender September 22, 2025

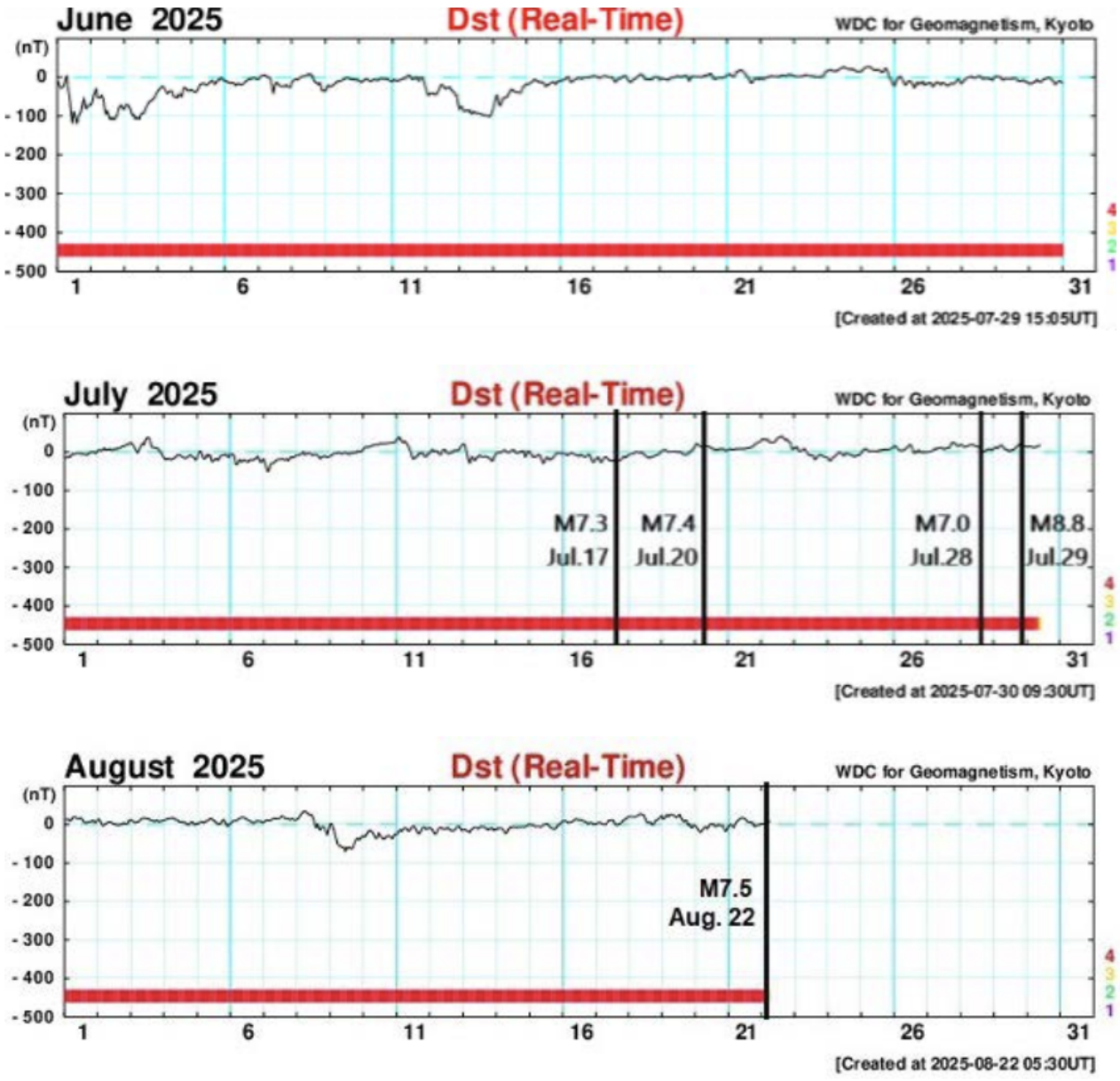

Figure 1. The hourly equatorial Dst values from the WDC for Geomagnetism, Kyoto, in June, July, and August of 2025; thick black lines mark dates of five strong earthquakes in July: M7.3 in Alaska; M7.4 in Kamchatka; M7.0 in Macquarie Island; M8.8 in Kamchatka; and in August: M7.5 in Drake Passage.

Dimitar Ouzounov [1,2] and Galina Khachikyan [3] expertly walk us through the strong earthquakes awakening in July and August of 2025, which geomagnetic storms could have provoked in June 2025

M8+ earthquakes usually happen once a year. However, since 2021, there have been no major earthquakes of magnitude 8 or higher. This drought ended in July 2025 with five M7+ events: a M7.3 in Alaska on 16th July, a M7.4 in Eastern Kamchatka on 20th July, the M7.0 in Macquarie Island on 28th July, an M8.8 earthquake in the Kamchatka Peninsula on 29th July, and an M7.5 in Drake Passage on 22nd August.

In a previous article (OAG, July 2025), we showed that geomagnetic storms can be followed by strong (M≥7) earthquakes in regions that were in the polar cusp corridor when the storm began. The time between a magnetic storm onset and an earthquake can range from a few days to about 2.5 months. In this article, we tested our hypothesis of a link between magnetic activity and major seismic activity with the earthquake awakening in July and August of 2025, which is probably connected to geomagnetic storms in June.

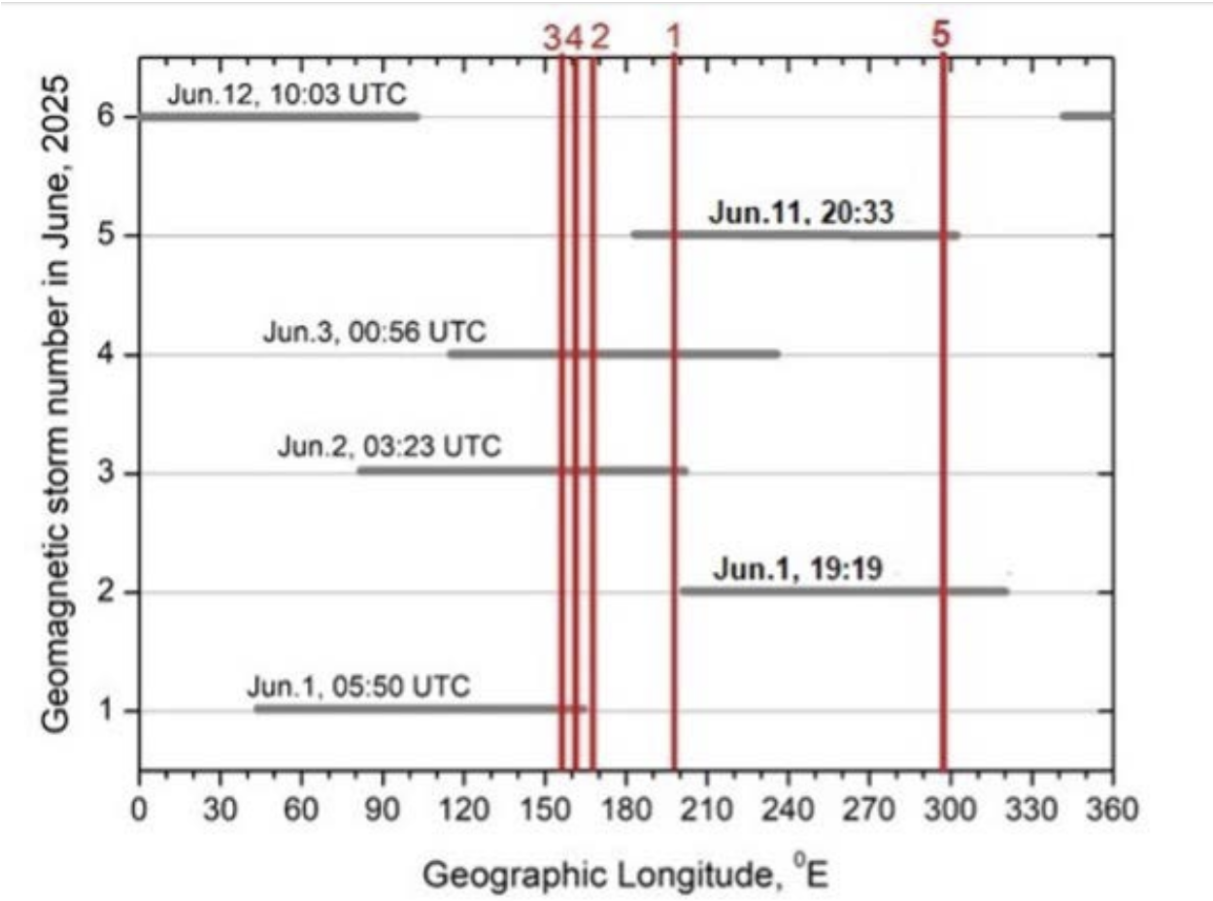

Figure 3. Horizontal thick black lines with text demarcate the longitudinal polar cusp corridor (120 degrees in longitude, MLT= 08-16h) during six geomagnetic storm onsets in June 2025. Red vertical lines with red digits at the top, mark the longitudes of four major and one great earthquakes:
1 – M7.3 in Alaska on 16th July; 2 – M7.4 in Kamchatka on 20th July; 3 – M7.0 at Macquarie Island on 28th July, and 4 – M8.8 in Kamchatka on 29th July, and 5 – M7.5 at Drake Passage on 22nd August. The intersection of a red line with the black lines indicates for which geomagnetic storm onsets the earthquake epicentre's area was located within the polar cusp corridor.

Research on earthquakes

In the second half of July 2025, there was a very high level of seismic activity in the longitudinal region 160oE – 200oE. 1) The M7.3 earthquake occurred in Alaska on 16th July at 20:37:39 UTC, with the epicenter at 54.549°N, 160.472°W, at a depth of 20.1 km; 2) The M7.4 earthquake happened in Eastern Kamchatka on 20th July at 06:49:01 UTC, with the epicenter at 52.909°N, 160.787°E, at a depth of 10 km; 3) The M7.0 earthquake occurred in Macquarie Island on 28th July at 22:10:34 UTC, with the epicenter at 57.637°N, 150.000°E, at a depth of 31 km; and 4) The M8.8 earthquake took place in the Kamchatka Peninsula on 29th July at 23:24:50 UTC, with the epicenter at 52.530°N, 160.165°E, at a depth of 20.7 km; and 5) The M7.5 earthquake occurred in Drake Passage on 22nd August 2025, at 02:16:19 UTC, with the epicenter at 60.186°S, 61.821°W, at a depth of 10 km.

In Fig. 1, five thin black curves on the three panels show the hourly equatorial Dst values from the WDC for Geomagnetism, Kyoto, for June, July, and August of 2025, respectively. The five thick black lines in the bottom panel indicate the dates of the five specified

earthquakes.

As shown in Fig. 1, strong geomagnetic storms (Dst ≤ -100 nT) occurred in the first half of June 2025 but were absent in the second half of June and July. It was noted that a strong solar flare, classified as M8.1, erupted from the Sun on 31st May 2025. The eruption generated a significant coronal mass ejection (CME) that struck Earth's magnetic field on 1st June at 05:42 UTC.

This impact triggered a series of geomagnetic storms ranging from moderate (G2) to severe (G4) levels. It produced the Northern Lights, which have been photographed as far south as latitude +30 N on the beaches of the Gulf of Mexico (Fig. 2 source).

To make our suggestion more visible that a magnetic storm may trigger strong earthquakes in a longitudinal corridor at a polar cusp location, let's consider a schematic Fig.3.

Conclusion

Figure 3 also indicates that the future epicentres of strong (M≥7.0) earthquakes were located in the polar cusp corridor at the onset of several recent geomagnetic storms (two to three). This implies that energy from solar wind and geomagnetic storms may accumulate in the Earth's crust until it reaches a breaking point, causing an earthquake. The geomagnetic storm immediately before an earthquake might be just the "last straw" for triggering it, even though energy may build up in a specific area for years, decades, or even longer (Landgraf et al., 2017). A considerable delay between a storm's start and an earthquake could mean that energy from solar wind and geomagnetic storms helps promote the upward movement of mantle fluids, potentially leading to seismic activity.

The idea that the strength of mantle fluid ascent can be affected by energy from solar wind and geomagnetic storms opens a promising path for further investigation. As shown in Fig. 1 (lower panel), a moderate geomagnetic storm (Dst = -71 nT) began on 8th August near 06 UTC, with a positive Dst of +34 nT. During this period, the region from about 30E to 150E longitude was in the polar cusp corridor. Based on our pattern, an increasing in seismic activities could be expected there in September-October 2025.

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