The 2024 Noto Peninsula earthquake: A long, quiet initial rupture leading to multiplex fault ruptures

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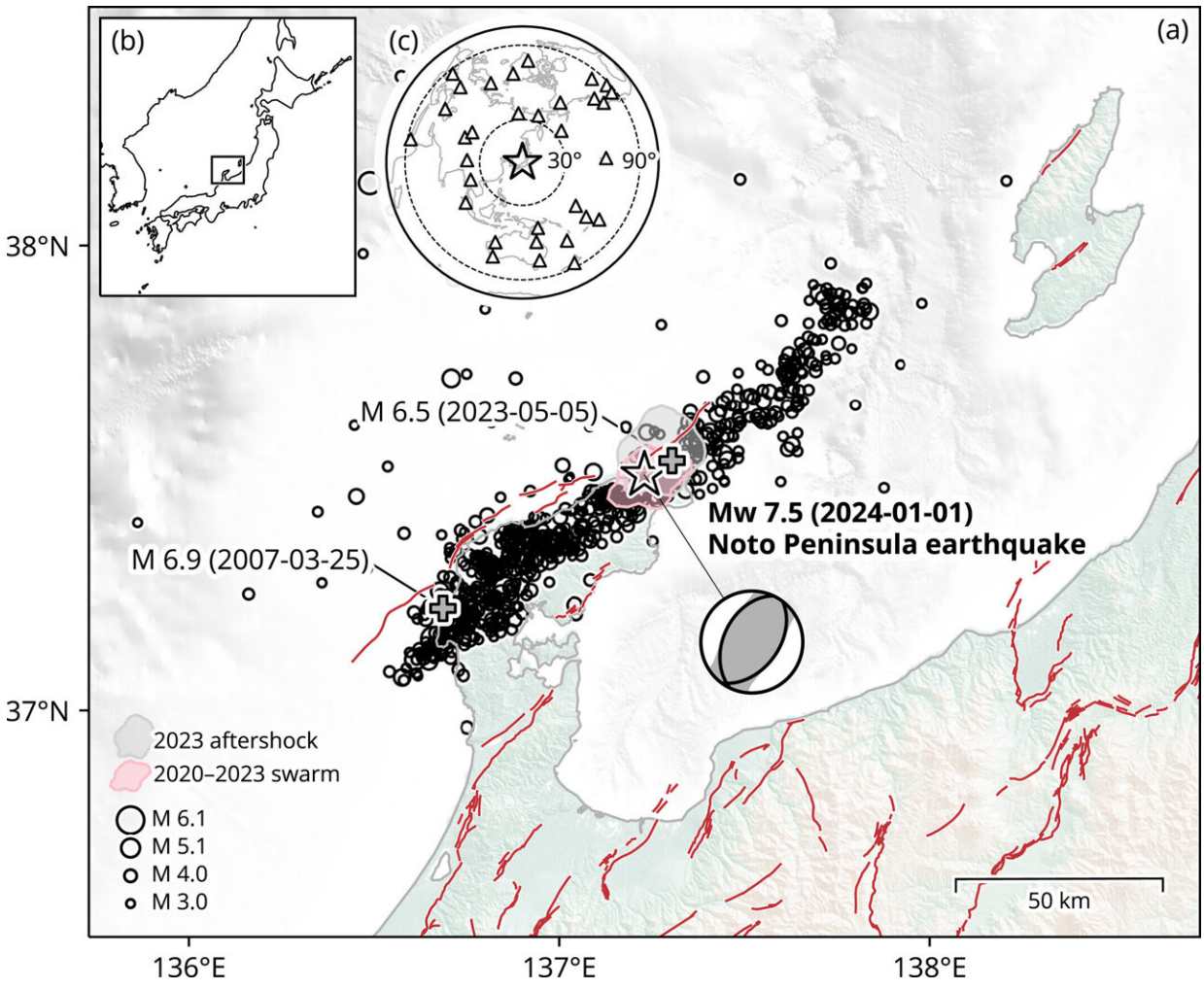

Summary of the study region of the 2024 Noto Peninsula earthquake. Credit: *Geophysical Research Letters* (2024). DOI: 10.1029/2024GL109224

At approximately 4:10 p.m. on January 1, 2024, the Noto region of Ishikawa Prefecture in Japan was hit by a large earthquake with a moment magnitude (Mw) of 7.5. This earthquake, known as the 2024 Noto Peninsula earthquake, registered a maximum seismic intensity of 7 on the Japanese scale and caused widespread damage, including numerous casualties.

Several active faults, primarily extending in a northeast-southwest direction, are known to exist in the Noto Peninsula and its surrounding areas.

For approximately three years prior to the earthquake, slow aseismic crustal deformation and active seismicity, which were believed to be associated with subsurface fluid movement, had been observed. Understanding how these active fault networks and crustal activities contribute to major earthquake ruptures is crucial for comprehending earthquake generation mechanisms and the production of intense shaking movements.

In a study, published in *Geophysical Research Letters*, researchers examined global seismic waveform data to estimate the rupture process of the 2024 Noto Peninsula earthquake.

Findings suggest that the earthquake comprised multiple rupture episodes. Notably, the initial rupture, which lasted approximately 10 s after the earthquake, coincided with the preceding active crustal activity zone. Moreover, the main rupture that followed the initial rupture was bifurcated into west and east ruptures across the initial rupture zone, where each zone had sequentially rupturing faults with varying orientations and inclinations.

This study highlights that the 2024 Noto Peninsula earthquake was governed by a network of faults with diverse geometries and that it was

closely linked to the crustal activity observed in the initial rupture zone prior to the main shock.

This intricate rupture growth process is anticipated to provide valuable insights for gaining an improved understanding of earthquake mechanisms and assessing earthquake damage risks.

More information: Ryo Okuwaki et al, A Multiplex Rupture Sequence Under Complex Fault Network Due To Preceding Earthquake Swarms During the 2024 Mw 7.5 Noto Peninsula, Japan, Earthquake, *Geophysical Research Letters* (2024). DOI: 10.1029/2024GL109224

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