Hyperdense seismic network reveals multiscale complexity in the young fault system that hosted the 2000 Tottori earthquake, Japan

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Young faults display complexity across multiple length scales, but it is unclear how this relates to earthquake occurrence. To address this issue, we obtained high-spatial-resolution images of seismic sources along a young fault zone in SW Japan and reconstructed the structural properties of the zone at seismogenic depths based on data from a hyper-dense network of 1000 seismic stations. A highly precise micro-earthquake catalog and seismic imaging reveal conjugate faulting over multiple length scales. These conjugate faults are well developed in zones of low seismic velocity. An aseismic blind fault is apparent as a thin, low-velocity band. A tiny, vertically dipping seismic cluster of ~200 m length localizes to a width of ~10 m. Earthquake migrations in this cluster have a speed of ~30 m/d, suggesting fluid diffusion. The spatio-temporal pattern of seismic activity could be controlled by multiscale complexity in this young fault system.

