

The diversity of similar earthquakes in subduction zone

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Generation mechanism of deep earthquakes in subduction slabs is still enigmatic. Through cross-correlation analysis of earthquakes in central Japan, we identify five pairs and one cluster of deep earthquakes showing strong waveform similarities (coherence > 0.9) for a 40-s time window at more than three stations. For those clusters, we relocate hypocenters by hypoDD, determine the focal mechanisms solutions, and carry out spectral analysis to estimate physical parameters of seismic ruptures (i.e., stress drop, radiated energy and efficiency). The obtained results show that some similar deep earthquakes in each cluster occurred at a slightly different spot on a single fault and have almost the same stress drop. The scaled energy and radiation efficiency of the groups precisely estimated from high-quality similar waveforms show that seismic parameters are significantly different between faults. A wide range of source parameters that have been reported for deep-focus earthquakes may not represent the differences in generation mechanisms of earthquakes but reflect the diversity of inherent fault frictional properties.

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