

Seismic Streaks and Holes: Geometric Control of the Parkfield Mw6.0 Earthquake Sequence

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Accurate relocation of microseismicity on the San Andreas Fault in California revealed a clustering of repeating earthquakes with highly organized hypocenter distribution, creating streaks and holes of seismicity along the Hayward Fault, the Calaveras Fault and the Parkfield segment. Using GPS, synthetic aperture radar interferometry and dynamic models of fault friction, we show that the repeating small-magnitude earthquakes at Parkfield may mark the first-order transition between stable and unstable friction and circumscribe the seismogenic zone. This geometric constraint allowed us to simulate numerically the sequence of Mw6.0 repeating earthquakes at Parkfield where each rupture can reproduce the recurrence interval, the hypocenter location and the surface displacements of the latest Parkfield event. Our results provide a physical interpretation for the distribution of microseismicity at Parkfield.