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isotropic seismic moment tensors, migrating and cyclic seismicity during the 2018 summit collapse at Kilauea caldera

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The 2018 rift zone eruption of Kilauea volcano was accompanied by a remarkable and episodic collapse of its summit. Between May-August the eruption and collapse sequence included over 70,000 earthquakes (M≥0) and 54 major earthquakes (M≥5). We analyzed the seismicity in the Kilauea summit region and estimated seismic full moment tensors with their uncertainties for the 54 M≥5 events. These events occurred at almost daily intervals and were accompanied by intense seismicity which was concentrated between 0-3 km depths beneath the Halemaʻumaʻu pit crater. The hypocenters reveal partial elliptical patterns (map view) that migrated downward by ~200 m. The moment tensors reveal remarkably consistent mechanisms, with negative isotropic source types and localized uncertainties, and vertical P-axis orientations. From the moment tensors we derived Poisson's ratios which are variable (ν=0.1–0.3) for the first half of the collapse events and converged to ν~0.28 from June 26 onward.

Promotional text

We analyzed 54 earthquakes from the 2018 eruption at Kilauea caldera. Their mechanisms reveal collapses similar to events following nuclear explosions in North Korea and the Nevada Test Site. The mechanisms at Kilauea appear related to evacuation-collapse of its magma reservoir.

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