

Systematic re-analysis of waveform data from the Hawaiian Volcano Observatory seismic network, 1992 to 2009

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The analysis and interpretation of seismicity from mantle depths to the surface plays a key role in understanding how Hawaiian volcanoes work. We present results from a comprehensive and systematic re-analysis of waveforms from 130,902 seismic events recorded by the USGS Hawaiian Volcano Observatory (HVO) permanent seismic network from January 1992 to March 2009. We have produced a comprehensive multi-year catalog of high-precision relocated seismicity for all of Hawaii Island using waveform cross-correlation and cluster analysis. The 17 years of relocated seismicity exhibits a dramatic sharpening of earthquake clustering along faults, streaks, and magmatic features, permitting a more detailed understanding of fault geometries and volcanic and tectonic processes. Our relocation results are generally consistent with previous studies that have focused on more specific regions of Hawaii. The relocated catalog includes crustal seismicity at Kilauea and its rift zones, seismicity delineating crustal detachment faults separating volcanic pile and old oceanic crust on the flanks of Kilauea and Mauna Loa, events along inferred magma conduits, and events along inferred mantle fault zones. Our cross-correlation and filtering parameters were optimized for high-frequency seismicity (volcano-tectonic and tectonic earthquakes); we are now working to produce a separate relocated catalog optimized for long-period (0.5-5 Hz) events. We are also estimating spectra systematically from every event recorded at every station to aid with event classification and to analyze spatial variations in Brune-type stress drop of shear-failure earthquakes.