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Source mechanisms of seismic events during the 2018 eruption of Sierra Negra Volcano (Galapagos) determined by using polarization properties of complete (near-field and far-field) body waves

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Sierra Negra is a basaltic shield volcano in the Galapagos Archipelago (Ecuador) and is the largest of the Galapagos volcanoes. The 2018 eruption was a complex event that included eruptive fissures opening on the northern rim and north-western flank. In this study, we report observations of seismic signals recorded on a temporary dense local network consisting of 14 seismometers and nearby permanent seismic stations, and analyze this data set to retrieve the source mechanisms of moderate pre- and co-eruptive seismic events (body-wave magnitude range of M3.5-5.3). Because of the shallow depths of the seismic events (<2 km) and short source-receiver distances (~1.5-10 km), that are comparable to or shorter than the wavelengths of radiated waves, the effect of near- and intermediate-field terms on dynamic displacements can be significant and hence the far-field assumption may not be well-suited for determining fault-plane solutions. Therefore, we pay special attention on the polarization properties of seismic waves excited at the near-field and intermediate-field ranges, and model and analyze complete displacement wave-fields to determine seismic sources. The source mechanism solutions are also interpreted in light of the volcanic unrest leading to the 2018 eruption, GPS observations, and reported regional centroid moment tensors.