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Understanding the closing stages of the last explosive cycle at Kīlauea Volcano by characterizing lavas from the ca. 1790 CE lower East Rift Zone eruption

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A series of fissures and lava flows in the lower East Rift Zone (LERZ) identified as products of an ^{14}C dated ca. 1790 CE eruption represent an understudied event in the eruptive history of Kīlauea. These lavas potentially represent the last eruption of Kīlauea's LERZ prior to arrival of European colonists in Hawai'i and erupted during a period of transition from predominantly explosive eruptions (Keanakāko'i Tephra, 1500 to late 18th century) to the current period of dominantly effusive eruptions. An explosive summit eruption in 1790 CE decimated a Hawaiian army and their families who were travelling through the area. Determining whether that eruption is linked to the ca. 1790 CE LERZ eruption is important for understanding the degree of connectivity between the summit and rift zone during that time. It would also test whether low magma supply rates previously inferred to produce explosive cycles at the summit are supported by LERZ eruptive characteristics.

Geologic maps show 23 fissure segments producing nine flows associated with this eruption, but published geochemical data consists of just 12 bulk-rock analyses [1]. We aim to characterize the chemistry and petrology of this eruption using whole-rock, mineral, and glass compositions, along with textural observations of near-vent lavas from 12 fissure segments. These observations will be used to determine the number and variety of distinct eruptive phases and to reconstruct the eruptive sequence. These datasets will also be used to determine if there are any genetic relationships between the ca. 1790 CE lavas and more recent eruptions in the LERZ (1955, 1960, and 2018 CE), or the historic 1790 CE eruption at the summit. Major and trace element chemistry of whole-rock samples show tholeiitic basalt compositions that are typical of LERZ lavas (MgO 4.7–10.1 wt. %) with a general trend of increasing MgO downrift (eastward) that appears to be the result of olivine accumulation. Ongoing mineral composition and zoning work may help identify any potential contributions from summit lavas from the same period [2].

[1] Wolfe, E. W., & Morris, J. (1996).
[2] Lynn, K. J. et al., (2017). *Contrib Mineral Petrol 172:76*