Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18517

Time-series petrologic and geochemical monitoring of the 2022 eruption of Mauna Loa, Hawai‘i

KENDRA J LYNN[1], FRANK A. TRUSDELL[1], DREW T. DOWNS[1], JOHN MICHAEL RHODES[2], JULIE M. CHANG[1], PATRICIA A. NADEAU[1], NINFA BENNINGTON[3], STEVE LUNDBLAD[4], CHERYL GANSECKI[4], BAYLEE MCDADE[4] AND MICHAEL J VOLLINGER[2]

[1]USGS Hawaiian Volcano Observatory
[2]University of Massachusetts - Amherst
[3]U.S. Geological Survey Hawaiian Volcano Observatory
[4]University of Hawai‘i at Hilo

Presenting Author: klynn@usgs.gov

Mauna Loa began erupting ~11:21 pm HST on November 27, 2022 for the first time in 38 years. Fissures opened within the summit caldera, Moku‘āweoweo, and a ~500 m-long fissure propagated towards the southwest but remained mostly within the caldera. By early morning on November 28, eruptive activity at the summit ceased and migrated into the Northeast Rift Zone (NERZ) with four fissures between 3755 and 3365 m asl, localizing to a singular vent by December 2. A network of channels fed ‘a‘ā flows 19 km down the north flank, producing a total volume of 150 million m^3 before the eruption ended on December 10. Petrologic and geochemical monitoring of the eruption included analysis of air-quenched samples from summit fissures and molten samples collected almost daily from NERZ fissures, in addition to measurements of the gas plume by DOAS (near-daily) and MultiGAS (sporadic). Near-real-time ED-XRF analyses were followed by WD-XRF and EPMA. Whole rock compositions are similar to other Mauna Loa eruptions since 1843 and are indicative of summit reservoir magmas. The lavas have whole rock MgO of 6.2 wt%, slightly lower than any eruption in ~200 years despite clear seismic and geodetic evidence of unrest and magma recharge in the years to decades before the eruption. Near-vent samples include rare phenocrysts of pyroxene and clusters of radiating plagioclases intergrown with pyroxene (additional chemical analysis will characterize their compositions). Glass MgO contents from near-vent samples are on average ~5.4 (± 0.1 1σ) wt%, reflecting a quench temperature around 1136 (±10) °C. For the duration of the eruption, and across the summit and upper NERZ (a distance of 17 km) remarkably similar compositions were discharged, indicating that the eruption was fed by a homogenous magma. This nearly aphanitic, low-MgO eruption was not influenced by mixing with 1984 rift-stored magma, but instead reflects magma from the shallow portion of the main reservoir 2-4 km beneath the summit, as reflected by the seismicity in the hour prior to the eruption onset. There were no detectable precursory SO_2 or CO_2 anomalies, and low syn-eruptive CO_2/SO_2 ratios were another indication that magma storage was shallow.