Anderson, K.R., Shea, T., Lynn, K.J., Montgomery-Brown, E.K., Swanson, D.A., Patrick, M.R., Shiro, B. and Neal, C.A., 2023, December. What Have We Learned From the 2018 Eruption of Kīlauea, and What Puzzles Remain? Five Years of Research Into a Transformational Event. In *AGU Fall Meeting Abstracts* (Vol. 2023, pp. V32A-01).

ABSTRACT

The 2018 eruption of Kīlauea Volcano (Hawai'i) was its most impactful in centuries, involving an outpouring of more than one cubic kilometer of basalt, a magnitude ~7 flank earthquake, and the volcano's largest summit collapse since at least the 19th century. Despite the challenges of the emergency response, a remarkable diversity of observations was captured; these have now served as the foundation for a wealth of studies which are changing our understanding of the volcano. We summarize results from the first five years of research efforts and identify important open questions. Findings include: 1) the eruption was caused by decades of accumulating, gravitationally driven opening stress on the East Rift Zone (ERZ), coupled with increasing magma pressure; 2) the scale of the eruption was a product of the low elevation ERZ vent and the collapse of the summit caldera, which pressurized the magma system and sustained flow; 3) collapse-induced reservoir pressurization, not magma-water interactions, produced explosive summit tephra eruptions; 4) the volcano's magmatic-tectonic system is tightly interconnected over tens of kilometers, with complex feedback mechanisms and interrelated hazards; 5) magma is stored at Kīlauea in diverse locations, volumes, and compositions; and 6) similar eruptions have happened numerous times in Kīlauea's past and will happen again, but involve cascading physical processes which remain difficult to forecast. Despite five years of intensive study numerous puzzles remain. The dynamics of the caldera collapse and implications for nonvolcanic earthquakes and other caldera systems are still being assessed; increases in the rate of magma supply to Kīlauea before and/or after the eruption have been suggested but remain unproven; the magma flow path between summit reservoirs and the ERZ - and the physical characteristics of magma storage in the rift - remain debated; the role of basal décollement slip in facilitating magma flow to the ERZ is unknown; and the long-term effects of the eruption on volcanism across the Island of Hawai'i - and implications for coupling between Hawaiian volcanoes - remains unclear. Efforts to answer these and other questions should improve our understanding of basaltic ocean island volcanism and our ability to assess and mitigate hazards during future eruptions.

Link: https://ui.adsabs.harvard.edu/abs/2023AGUFM.V32A..01A/abstract