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Mechanical interactions between pressure sources and rift zones at Kilauea Volcano, Hawaii.

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Underground pressure sources and rift zones may act jointly during phases of volcanic activity. Pressurization of magma bodies at shallow to intermediate depth, along with degradation of the mechanical properties of the host rock, can enhance tensile stress along zones of weakness, thus favoring magma intrusion. Such interactions were hypothesized at different volcanoes, including Mt. Etna, Piton de la Fournaise and Montserrat, from seismic, gravity and ground deformation data. Here we use a finite-element modeling approach to quantitatively understand possible mechanical interactions between a shallow pressure source beneath the summit caldera and the rift zones at Kilauea Volcano (Hawai'i). Past studies have demonstrated a strong connection between these structures, for example, with increases in seismic activity and extension across the rift, during phases of inflation of the summit. These observations suggest a coupling, which may modulate magma accumulation and transport processes along the rift.