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Deciphering the Relationship Between the 1949, 1971, and 2021 Eruptions in La Palma, Canary Islands, Spain

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La Palma is one of the youngest and westernmost islands in the Canary Archipelago with the three most recent eruptions being the San Juan (1949), Teneguia (1971), and Tajogaite (2021). The three eruptions share many similarities: they all started with basanitic magmas that contained amphibole, pyroxene, and olivine, and evolved into basanitic-tephritic magmas that contained abundant pyroxene. The 2021 eruption started with a low-MgO (6 wt.%) amphibole-bearing magma, but the magma became progressively more mafic until reaching >8% MgO, at which point the composition remained relatively constant. This could be explained if the 2021 eruption was the product of an interaction of a new magma batch with a residual melt from a prior eruption, potentially the 1949 and/or 1971 magma. This would be important in suggesting a shared magmatic plumbing system, and the propensity for initiation of eruptions with more evolved and potentially more explosive magmas. In order to test this, we collected a suite of samples from the 1949, 1971 and 2021 eruptions to analyze and compare in terms of petrography, major and trace element abundances, and Sr-Nd-Pb-Hf isotopic signatures. Petrographically, the early phase of the 2021 eruption was characterized by the presence of amphiboles, which are not ubiquitous in La Palma magmas, but which were also present in the 1949 and 1971 eruptions. The early 2021 magmas overlap entirely in major element as well as compatible and incompatible trace element abundances with magmas from the 1949 and 1971 eruptions. In addition, the Sr-Nd-Pb-Hf isotopic compositions of the early 2021 magmas overlap with those of 1949 and 1971 and are consistent with the range of isotopic signatures found in other historic eruptions of La Palma, suggesting that they all shared a similar mantle source. Thus, to distinguish whether the 2021 eruption tapped residual magma from the 1949, 1971, or older eruptions, we will conduct U-series disequilibria analyses ($^{210}Pb/^{226}Ra$, $^{226}Ra/^{230}Th$), which have the potential to distinguish discrete magma batches from the same source, and to provide constraints on partial melting, degassing, and timescales of magma production, storage, and ascent.