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Felsic magma storage in ocean islands; Insights from Miocene microsyenite samples from Gran Canaria, Canary Islands

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The exposed Miocene syenites of central Gran Canaria provide a rare opportunity to better understand the magma plumbing system that fed the highly explosive felsic volcanism of the island, but fresh syenitic material is rare due to pervasive hydrothermal alteration within the central sub-volcanic system. In this study, we employ fresh microsyenite samples recovered from Miocene coastal conglomerates that escaped hydrothermal overprint, plutonic xenoliths in ignimbrite deposits, and cone sheet phonolites to reconstruct the storage conditions and evolution of the felsic magmatic system. We also report on several syenites and uplifted Mesozoic sedimentary rocks from the neighbouring island of Fuerteventura. The Gran Canaria microsyenites are alkaline and have Zr/Nb ratios characteristic of late Miocene Fataga group volcanics, while the Fuerteventura syenites show similar geochemical characteristics. Oxygen isotope values for the microsyenite samples together with major element trends point to generation via magmatic fractionation coupled with a limited component of assimilation. Mineral-melt thermobarometry places the bulk of clinopyroxene crystallisation in magma reservoirs between 5 and 13 km depth, which coincides with the felsic plutonic complex inferred from seismic tomography to make up the core of the island. We hence infer that the syenite reservoirs in the upper island edifices of the Eastern Canaries facilitated fractional crystallisation and crustal assimilation, which drove Fataga group magma compositions on Gran Canaria towards highly alkaline felsic compositions that fed trachytic and phonolitic ignimbrite eruptions in the closing phase of the Miocene eruptive cycle.