

## **Multi-level magma plumbing at Agung and Batur volcanoes increases risk of hazardous eruptions**

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The island of Bali in Indonesia is home to two active stratovolcanoes, Agung and Batur, but relatively little is known of their underlying magma plumbing systems. Here we define magma storage depths and isotopic evolution of the 1963 and 1974 eruptions using mineral-melt equilibrium thermobarometry and oxygen and helium isotopes in mineral separates. Olivine crystallised from a primitive magma with average  $\delta^{18}\text{O}_{\text{melt}}$  values of 5.2‰. Clinopyroxene records magma storage at the crust-mantle boundary, consistent with mantle-like He isotope values and  $\delta^{18}\text{O}_{\text{melt}}$  values of 5.3-6.1‰. Plagioclase, reveals crystallisation in upper crustal storage reservoirs with  $\delta^{18}\text{O}_{\text{melt}}$  values of 5.3-6.2‰. Our new thermobarometry and isotope data thus corroborate earlier seismic and InSAR studies that inferred upper crustal magma storage in the region. Such type of multi-level plumbing architecture could drive replenishing magma to rapid volatile saturation, thus increasing the likelihood of explosive eruptions and the consequent hazard potential for the population of Bali.