

The 2023-2024 eruptions at Svartsengi, Iceland, reveal a dynamic mid-crustal magma domain

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In December 2023 the first in a series of volcanic eruptions occurred in the Svartsengi volcanic system on Iceland's Reykjanes peninsula, the first eruption in ~800 years. Extensive sampling campaigns throughout and following each of the eruptions has revealed a complex and dynamic magmatic system, with pre-eruptive magma storage in the mid-crust. The eruption at the neighbouring Fagradalsfjall complex in 2021 provided a near real-time view of magmatic processes occurring near the Moho [1,2]; the Svartsengi eruptions provide us with a similar, unprecedented, view into the working of mid-crustal magma domains.

Previous eruptions derived from magma domains in Iceland's mid-crust have erupted lavas with virtually no mantle-derived geochemical variability (e.g., in radiogenic isotopes or incompatible trace element ratios) [3,4]. Extraordinarily, within the first hours of the eruptions at Svartsengi, high amplitude mantle-derived variability was erupted from the same fissure, indicating the involvement of multiple magma reservoirs. The amplitude and mean composition characterising the variability have changed from eruption to eruption, showing that the magma domain feeding these eruptions is dynamic. This has implications for our understanding of mid-crustal magmatic systems and how we interpret real-time monitoring data.

[1] Halldórsson et al. (2022), *Nature* 609, 529-534.

[2] Marshall et al. (in prep)

[3] Halldórsson et al. (2018), *Contributions to Mineralogy and Petrology* 173.

[4] Caracciolo et al. (2023), *Earth and Planetary Science Letters* 621.