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CONSEQUENCES OF INJECTION OF AN ULTRAPHYRIC BASALTIC MAGMA INTO A ZONED SILICIC MAGMA CHAMBER: A DIVERSE SUITE OF TERTIARY LAVAS IN NORTH-CENTRAL ICELAND

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In the course of Keck Geology Consortium projects in 2003 and 2004 a sequence of intermediate and silicic volcanic units was mapped within the Tertiary tholeiitic basalt pile in the mountains Laxardalsfjall and Langadalsfjall in the southern Skagi Peninsula of Iceland. This sequence consists of several minor rhyolite lavas overlain by a large ($>3 \text{ km}^3$), lithologically diverse, andesite to rhyolite lava flow, and a more extensive upper rhyolite lava. Pyroclastic deposits of variable thickness occur within the sequence. This sequence was erupted at 7.8 Ma, not long before the 7 Ma abandonment of the Skagi-Snaefellsnes rift zone in which it was erupted. The lower rhyolites are of variable composition (71-75% SiO_2) and the upper is a high-silica rhyolite (75-76% SiO_2). The andesite-rhyolite lava flow is heterogeneous with $<<1\%$ to 20% coarse (up to 3 cm), nearly equant, plagioclase phenocrysts and variable groundmass characteristics. Lithologies commonly vary across sharp borders within the flow, with domains of different lithologies being up to 10s of m in extent. The whole rock composition varies from andesite (58% SiO_2) to rhyolite (70% SiO_2). Silica content is inversely correlated with phenocryst abundance but can not be explained by phenocrysts alone. The coarse plagioclase phenocrysts have calcic cores up to An_{87} , commonly with lower-An rims, indicating an origin in a basaltic magma. A wide range of mixing and mingling textures are observed at both the mesoscopic and microscopic scales. Major and trace element variations indicate that the end members of mixing are a plagioclase-rich basalt and a range of silicic compositions from dacite to low-silica rhyolite. A candidate for the mafic end member of mixing is a plagioclase-ultraphyric basalt flow mapped in Vatnsdalsfjall (~10 km away). It has similar coarse equant plagioclase phenocrysts, with identical An-contents and patterns of inclusions. We propose that a dike that fed this flow also propagated at depth into a zoned dacite-rhyolite magma chamber, in a manner similar to the AD 1480 propagation of the Veidivotn fissure into the Torfajokull caldera. This triggered small rhyolitic eruptions quickly followed by a large eruption from the zone of mixing, then a significant eruption from the most evolved upper portion of the magma chamber.

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