Reviewed research article

A gravity study of silicic domes in the Krafla area, N-Iceland

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Abstract – *Silicic rocks in Iceland are generally associated with central volcanoes and are often emplaced as domes on or around caldera rims. Some of these domes were formed subglacially while others were erupted under ice-free conditions. A gravity survey was carried out in the area of Krafla in 2007 and 2008 to determine the mean bulk densities of three silicic domes; essential data for meaningful modelling of the emplacement of cryptodomes and lava domes. Such data are scarce. Profiles were measured over three formations: Hlíðarfjall, made of rhyolite, 310 m high, 2 km long and formed under ice 90 000 years BP, Hrafntinnuhryggur, made of rhyolite, 80 m high, 2.5 km long and formed subglacially 24 000 years BP and Hraunbunga made of dacite, 125 m high and 1.8 km long, formed under ice-free conditions 10 000 years BP. Mean bulk density for each formation was obtained by the Nettleton method. Mean bulk density and volumes obtained were; Hlíðarfjall: 1600-1800 kg m^{-3}, 0.143 $\pm$ 0.014 km^3; Hrafntinnuhryggur: 1575–1875 kg m^{-3}, 0.021 $\pm$ 0.002 km^3; Hraunbunga: 1750–1775 kg m^{-3}, 0.040 $\pm$ 0.004 km^3. The results show that all the domes have low densities, reflecting both low grain-density and high porosity. The density values are significantly lower than those of the surroundings, creating a density contrast possibly sufficient to drive the ascent of silicic magma. Furthermore, results from forward gravity modelling demonstrate that these formations are neither buried by younger volcanic eruptives nor are any roots detected. The domes studied were therefore emplaced by a dike to the surface.*