

## **Structure of phreatomagmatic crater rows from gravity surveying. Conduit shape comparisons between the fissures of the 871 AD Vatnaöldur and 1477 AD Veidivötn eruptions, south central Iceland**

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The 60 km long Vatnaöldur and Veidivötn volcanic fissures in south central Iceland belong to the same SW-NE trending fissure swarm that is part of the Bardarbunga volcanic system. Eruptions on the fissure swarm have in postglacial times been both effusive, producing large lava fields, and explosive, producing the largest known basaltic tephra layers in Iceland. Ground water level is high within the southwestern part of the fissure swarm and a large river flows through the volcanic area.

The two most recent eruptions on the southwestern part of the fissure swarm occurred in 871  $\pm$ 2 AD when the crater row of Vatnaöldur was formed, and in 1477 AD, when the Veidivötn fissure was active. Both eruptions produced basaltic tephra layers of several cubic kilometres. Minor effusive phase at the end of the Veidivötn eruption, filled the bottom of the large phreatomagmatic craters from the main phase, while only tephra was produced in the earlier Vatnaöldur eruption.

The aim of the project is to model the structure of some volcanic conduits from both fissures, in order to figure out their filling materials and understand better their process of formation. A large density contrast is to be expected between the crater rims made of tephra (density 1200-1900 kg/m<sup>3</sup>) and the lavas that fill the Veidivötn craters (2300-2700 kg/m<sup>3</sup>). Therefore the gravity method was chosen to figure out the volcanic structures.

Six profiles were surveyed across six explosive craters using a LaCoste Romberg gravity meter and kinematic GPS. Complete Bouguer anomalies were obtained by integrating the gravitational effects of the mass of the topography using a high resolution DEM. Two profiles cross the Veidivötn fissure whereas the other four cross Vatnaöldur. Preliminary results do not indicate gravity anomalies associated with the conduit of the fully phreatomagmatic Vatnaöldur crater row, suggesting that the crater fill has the same density as the surrounding bedrock of tephra, hyaloclastite and lava. In contrast, the lava-filled craters of Veidivötn show up as gravity highs. Forward models of the craters indicate the existence of a few hundred meters wide and >100 m deep lava fill in the phreatomagmatic Veidivötn craters. The results therefore indicate considerable excavation of the pre-existing uppermost part of the bedrock in these powerful phreatomagmatic eruptions.