

Lava fountaining and vent morphology analyzed at the 2014 Holuhraun eruption, Iceland, by video monitoring and topographic mapping

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Fissure eruptions are commonly linked to magma at depth and lava fountaining at the surface. Shortly after the onset of eruptive activity, erupting fissures begin to focus their activity at distinct vents, resulting in the formation of morphological craters shaping the sites of the eruption. A detailed analysis of the morphological development during fissure eruptions and the link to the lava fountain activity has not been conducted in large detail so far.

To analyze the lava fountains in height and venting activity and compare that to the vent morphology, we used videos recorded from different locations at a distance up to 2 km during the first few days of the 2014 main Holuhraun eruption, Iceland. The videos have lengths of up to 2 hours and focus on the main eruptive vents. To investigate the morphology of the developing craters after the eruption in detail, a fieldwork mapping project combining terrestrial laser scanning (TLS) and unmanned aerial vehicle (UAV) based aerophoto analysis was realized in summer 2015. From the data, we generated a locally high-resolution digital elevation model by structure from motion (SfM) at the eruptive vents.

We found that at the locations of highest venting activity the lava spatters formed craters during the very initial phase of the eruption of 4 days. Comparison to post-eruptive topography shows that the craters remain similar in shape, but increase in size as the eruption progressed. Therefore, the remaining morphology is mostly conditioned in the beginning of the eruption. Furthermore, the smaller craters of Sudri show distinct lava fountains, which are much smaller and thinner than the ones from the bigger Baugur crater. Comparably, the activity of the lava fountains is a little bit lower at Sudri. The Baugur crater is the locus of several high lava fountains, which slightly move in location by up to 20 m and intertwine/overlap each other. This might be due to the presence of the large lava lake at the Baugur crater. In conclusion, the morphology of eruptive vents can be roughly deduced from the structure and lava fountain activity at the beginning of a fissure eruption.