

Dynamics at the Holuhraun eruption based on high speed video data analysis

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The 2014/2015 Holuhraun eruption was an gas rich fissure eruption with high fountains. The magma was transported by a horizontal dyke over a distance of 45km. At the first day the fountains occur over a distance of 1.5km and focused at isolated vents during the following day. Based on video analysis of the fountains we obtained a detailed view onto the velocities of the eruption, the propagation path of magma, communication between vents and complexities in the magma paths.

We collected videos from the Holuhraun eruption with 2 high speed cameras and one DSLR camera from 31st August, 2015 to 4th September, 2015 for several hours. The fountains at adjacent vents visually seemed to be related at all days. Hence, we calculated the height as a function of time from the video data. All fountains show a pulsating regime with apparent and sporadic alternations from meter to several tens of meters heights. By a time-dependent cross-correlation approach developed within the FUTUREVOLC project, we are able to compare the pulses in the height at adjacent vents. We find that in most cases there is a time lag between the pulses. From the calculated time lags between the pulses and the distance between the correlated vents, we calculate the apparent speed of magma pulses. The analysis of the frequency of the fountains and the eruption and rest time between the the fountains itself, are quite similar and suggest a connection and controlling process of the fountains in the feeder below.

At the Holuhraun eruption 2014/2015 (Iceland) we find a significant time shift between the single pulses of adjacent vents at all days. The mean velocity of all days is 30-40 km/hr, which could be interpreted by a magma flow velocity along the dike at depth. Comparison of the velocities derived from the video data analysis to the assumed magma flow velocity in the dike based on seismic data shows a very good agreement, implying that surface expressions of pulsating vents provide an insight into the magma propagation dynamics at depth.