

Lava field evolution and emplacement dynamics of the 2014-2015 basaltic fissure eruption at Holuhraun, Iceland

G.B.M. Pedersen, A. Höskuldsson, T. Dürig, T. Thordarson, I. Jónsdóttir, M.S. Riishuus, B.V. Óskarsson, S. Dumont, E. Magnusson, M.T. Gudmundsson, F. Sigmundsson, V.J.P.B. Drouin, C. Gallagher, R. Askew, J. Guðnason, W.M. Moreland, P. Nikkola, H. I. Reynolds, J. Schmith

The 6-month long eruption at Holuhraun (Aug. 2014- Feb.2015) was the largest effusive eruption in Iceland in 230 years with an estimated bulk lava volume of $\sim 1.44 \text{ km}^3$. The eruption has been divided into three phases based on the evolution of the lava field.

The first phase (~ 6 weeks) was dominated by open lava channels and the emplacement of four main lava flows (No. 1 to 4). The lava flows were predominantly cooling limited and the longest is lava flow no. 1, which reached the length of 17 km.

Lava emplacement during the second phase (~ 6 weeks) was influenced by the formation of a 1 km^2 lava pond about 1 km downstream of the vent. This pond became the main distribution point for the lava transport during phase 2, controlling the emplacement of three new lava flows. Towards the end of phase 2 lava resurfacing became more predominant and lava tubes developed within lava flow no. 1, resulting in formation of inflation plateaus.

In the third and final phase (3 months), transport of lava through tubes dominated the lava transport and inflating plateaus grew in extent in lava flows (no. 1-2), raising the channel surface by 5-15 m above the surrounding lava. These inflation plateaus were the surface manifestation of a growing lava tube system, which formed as lava ponded upstream in the open lava channels. This created sufficient lavastatic pressure in the fluid lava core to lift the roof of the lava channels. More than 19 km^2 of the lava field was resurfaced during this period, while lava was transported to the distal part of the lava field.

A suite of lava morphologies (shelly pāhoehoe, slabby pāhoehoe, rubbly pāhoehoe, spiny pāhoehoe and 'a'ā; Fig. 1) was observed within the first week of the eruption. During phase 1 and 2 'a'ā was the dominant flow morphology in all main lava flows while spiny pāhoehoe was the typifying lava morphology in phase 3. These changes in surface morphology makes the 2014-2015 Holuhraun lava a paired flow field and the development of lava tubes in the existing channels within the 'a'ā flow may explain why paired lava flows often have similar length.

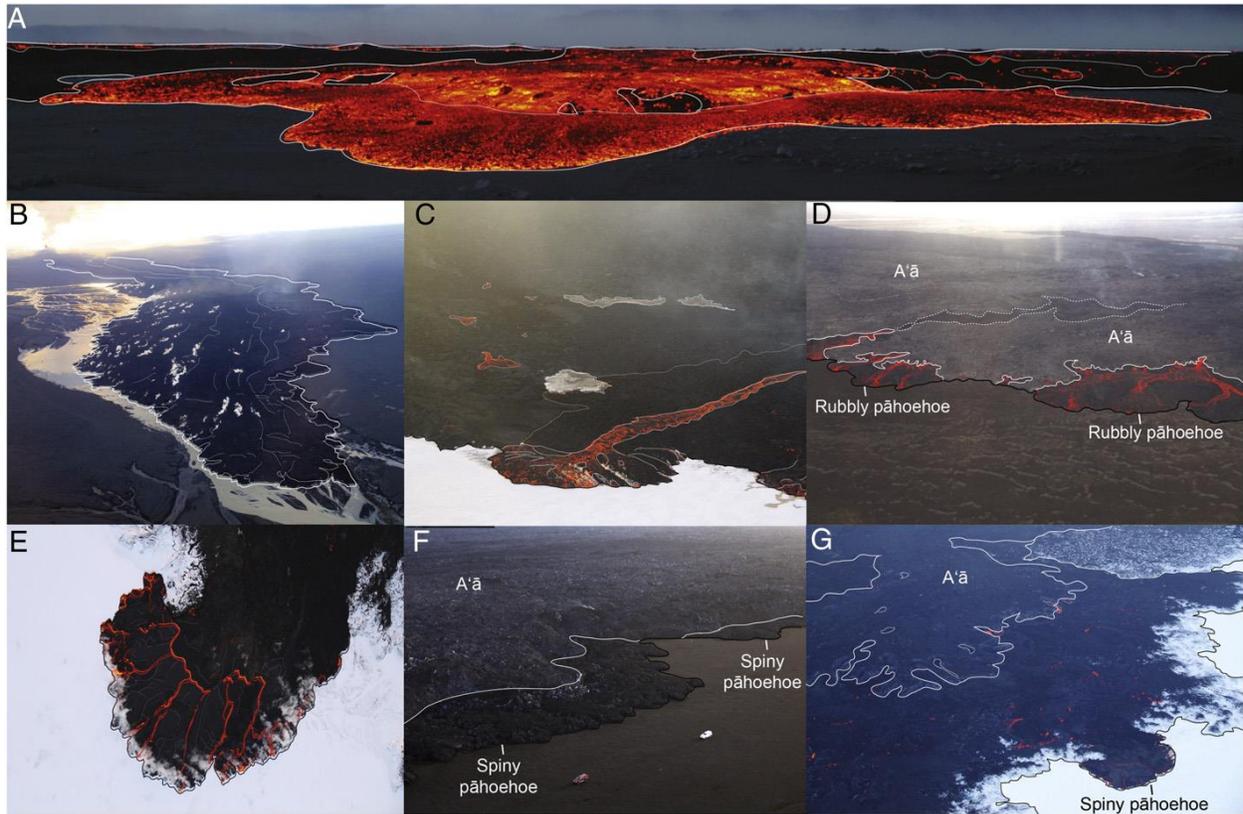


Figure 1. Examples of active lobe morphology
