

PYRODUCTS, THE THIRD MOST COMMON CAVE TYPE ON EARTH

Stephan Kempe

*Institute for Applied Geosciences, Techn. Univ. Darmstadt and Hawaii Speleological Survey
Schnittspahnstr. 9
Darmstadt, D-64827, Germany, kempe@geo.tu-darmstadt.de*

Christhild Ketz Kempe

*Am Schloss Stockau 2
Dieburg, D-64807, Germany, christhild.ketz-kempe@gmx.de*

Abstract

After limestone and gypsum, lava is the third most important cave-bearing rock on Earth. In contrast to the standard notion that lava caves are simple, uninteresting and featureless circular or semicircular “tubes”, many different processes serve to create a score of various lava cave classes, with more being discovered (Kempe, 2002, 2012b). The most important type is longitudinal conduits that serve for long-distance, underground,

were first observed actively forming in Hawai‘i and in 1844 named “pyroducts” (Coan, 1844; Lockwood and Hazlet, 2010). Within the pyroduct type at least four different formation modes exist (Figure 1; Kempe, 2012a): Caves formed by inflation of the lava flow front and later downward erosion (1a), caves formed by coalescence of small ducts and consecutive downward erosion (1b), caves formed by the crusting-over of channels by floating lithoclasts, welded together (1c), and by channels crusted-over by lateral shelf accretion

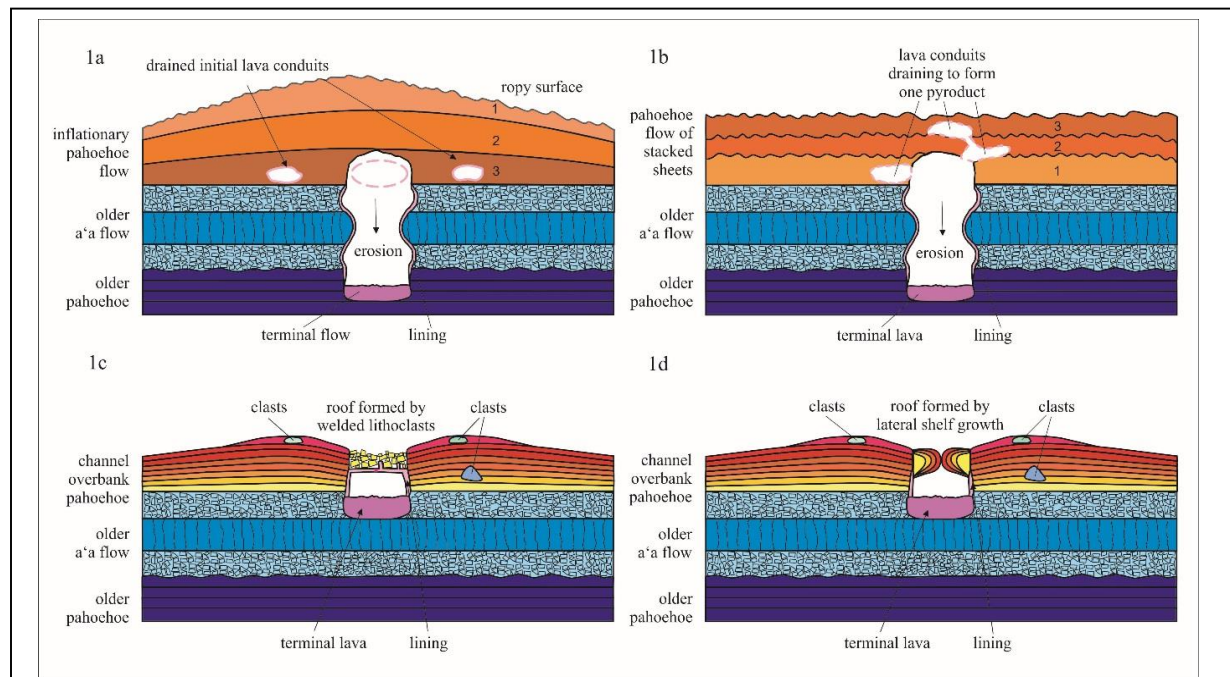


Figure 1. Within the pyroduct type at least four different formation modes exist: Caves formed by inflation of the lava flow front and later downward erosion (1a), caves formed by coalescence of small ducts and consecutive downward erosion (1b), caves formed by the crusting-over of channels by floating lithoclasts, welded together (1c), and by channels crusted-over by lateral shelf accretion and consecutive closure (1d) (Kempe, 2012a).

post-eruptional transport of (with a few exceptions) basaltic lavas. They act to build low-slope (often < 2°) shield volcanoes. Initially reported from Iceland, they

and consecutive closure (1d). Thermal erosion, probably both by re-melting and mechanical processes, ensures that a gas-filled cave is already created during the

active phase of the pyroduct and not by “evacuating” a “tube” after the eruption ceased. Pyroducts therefore resemble underground canyons with lava rivers at their bottom. They are the most numerous lava caves; the longest being Kazumura Cave (total length of passages 65.5 km) (Hawai‘i, Kilauea Volcano) (Allred and Allred, 1997; Allred et al., 1997) and the longest Quaternary duct-supported flow on Earth is the 160 km long Undara flow, Australia (Atkinson, 1993). In Jordan, the Al-Fahda flow may have had pyroducts as long as 25 km (Kempe et al., 2009).

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