

Lava flow channelisation and levee formation/failure dynamics

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Lava flow levees are an important target for modelling advances because secondary flow branching and lateral expansion of channelized lava flows can pose significant dangers within evolving flow fields throughout the duration of an eruption and are an under-appreciated hazard. While branching has been modelled with relative ease, the mechanism of channelisation over space and time has proven a more elusive target. Studies of cross-channel rheologic profiles and the growth of channel networks generally do not incorporate the growth or evolution of levee structures. Field descriptions of individual lava levees in Hawai'i and on Mt Etna document diverse construction histories with intricate internal structure variation, while modelling efforts have mainly focused on simple two-dimensional geometries with homogenous material properties. Determining how to classify three-dimensional levee structures for modelling purposes, identifying which types are prone to post-emplacement deformation (and potentially failure), and establishing which observables are needed to understand structural evolution are key steps forward.