

Public Abstract

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Title:Rheology of crystallizing basalts from Nyiragongo and Nyamuragira volcanoes, D.R.C.

Nyiragongo, a stratovolcano located within the Virunga Volcanic Province on the western branch of the East African Rift, is known for persistent lava lake activity as well as devastating eruptions in 1977 and 2002. The 2002 eruption caused a humanitarian crisis when channelized lava flows entered the nearby city of Goma killing 170 people and displacing ~350,000 others. These lavas have unusually low silica contents (39-42 wt.% SiO₂) and are very fluid, allowing flows to move rapidly downslope. The rheology of lavas from Nyiragongo was measured using viscometry over a range of temperatures from 1221°C to 1145°C. The viscosity is similar to that of Hawaiian lavas at high temperatures where the samples are completely molten. Over the experimental temperature range, the crystal fraction remains very low. Consequently, the change in viscosity is due primarily to cooling effects rather than physical or chemical effects of crystallization. Crystal fraction and lava viscosity both increase rapidly below 1145°C, preventing further experiments. Lavas from the neighboring shield volcano, Nyamuragira, show significant crystallization at temperatures much closer to the onset of crystallization. While still fairly fluid, it is more viscous than Nyiragongo lavas and also crystallizes more rapidly upon cooling.

Recently, the stratovolcano (Nyiragongo) has erupted lava more fluid than those erupted by the nearby shield volcano (Nyamuragira), producing fast-moving flows that pose imminent danger to the inhabitants of Goma. Such fluid flows would be expected to move quickly away from the vent and not result in the buildup of a steep-sided edifice that is characteristic of Nyiragongo. Consequently, lava flow inundation hazard cannot be predicted solely by the morphology of the volcanoes from which the flows erupt.