Physical Volcanology, Geomorphology, and Cosmogenic He Dating Of the Youngest Kimberlite Volcanoes On Earth (The Holocene Igwisi Hills Volcanoes, Tanzania.

Authors

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Abstract

The Igwisi Hills kimberlite volcanoes (IHV;Sampson 1953; Reid et al. 1975; Dawson 1994) are thought to be very young (Quaternary) but no reliable radiometric dates have yet been published. The next youngest kimberlite rocks are Eocene- Oligocene in age. Because of their youth, the IHV still have surface rocks and volcanic constructs. Kimberlite pyroclastic rocks emplaced on the Earth's surface, as opposed to within vents, have eat potential to provide insight into eruptive dynamics, much as they have for other volcanic systems. The IHV are located on the western side of the Archaean Tanzanian craton, several kilometres NW of the village of Igwisi. They were emplaced through granitic gneiss basement. The IHV were first recognised by the Geological Survey of Tanganyika in the early 1950s (Sampson 1953). Subsequent studies focussed mainly on the petrology of the lava flow from the NE volcano and its mantle xenoliths (Reid et al. 1975; Dawson 1994). Dawson (1994) concluded that the mineralogy, major element and isotope chemistry of the Igwisi Hills rocks have strong affinities with calcite-rich kimberlites (e.g. Benfontein sills, South Africa). Little is known about the physical volcanology of the volcanoes, except that they comprise three volcanic centres formed of cones and craters of pyroclastic rocks and lavas. The IHV consist of three small volcanic centres (NE, Central and SW volcanoes) comprised of pyroclastic cones, craters and lavas. Together they constitute >3.2 × 106 m3 of erupted products preserved above the Earth's surface and cover >2.7 × 105 m2. The relative ages of the IHV cannot be fully constrained, although field relationships indicate that the Central volcano postdates the NE volcano. They are aligned NE–SW and sit upon a broad, low NE–SW-oriented ridge, 500 m wide that is probably comprised of pyroclastic material (poorly exposed) from early stages of the eruptions. The volcanoes have been partially buried by younger sedimentary rocks and soils, and are presently covered in grassland and low-density forest. They exhibit similar pyroclastic lithofacies and all have small volume extrusions of lava.

Keywords:

Volcanology; Geomorphology; Cosmogenic; Igwisi Hills; Volcanoes; Tanzania