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Using Trace Element And Noble Gas Geochemistry To Evaluate Volcanic Hazards At The Nyiragongo And Nyamuragira Volcanoes, D.R. Of Congo

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Goma, a city located in the Virunga Volcanic Province along the border between the Dem. Rep. of Congo and Rwanda, has experienced explosive population growth following the civil war started in 1996 and persisting today related to political unrest in the area. The population growth occurs despite the presence of two very active volcanoes (Mt. Nyiragongo and Mt. Nyamuragira) within ∼18 km of the city center. In January 2002 Mt. Nyiragongo erupted pouring lava into the city of Goma killing ∼180 people and leaving 130,000 homeless. Because of the poor understanding of this volcano, its unique silica-undersaturated lava composition, and a recent change to fissural flank eruptive style, traditional volcanic hazard prediction techniques are difficult to apply.
Presently both volcanoes (Mt. Nyiragongo (current lava lake) and Mt. Nyamuragira (January 2010 eruption) are very active emitting lava and gas with unique and paradoxical composition despite their close geospatial proximity (∼12km). Mt. Nyiragongo has an actively rising lava lake characterized by one of the most alkaline and foiditic compositions on earth. We present a statistical model of trace element data for lava samples taken from Nyamuragira (2006 and 2010 eruptions) and Nyiragongo (2002 eruption and 2004 and 2010 lava lake samples), focusing on REEs, HFSEs, and actinides (Th/U) in the context of volatile emissions (δ13C-(CO2), CO2, noble gases (e.g. 3He/4He, 40Ar/36Ar) to explore mantle processes leading to the unique lava compositions and trace element compositional changes throughout this period. This geochemical and statistical approach, then combined with geophysical measurements, will be used to generate a volcanic hazard model to make predictions about the state of Nyiragongo and Nyamuragira system, and its possible future activity, trying to understand the geologic behaviour of the region on both a short and a long-term timescale to better evaluate long term volcanic risk assessment.