



Cities on Volcanoes 8

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Explosive volcanic activity along the urbanized Northern shoreline of Lake Kivu, DR Congo and Rwanda

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The Virunga Volcanic Province (VVP) lies within the western branch of the East-African Rift, and hosts eight central volcanoes. One of these, Nyiragongo volcano, lies to the immediate north of Goma city, a densely urbanised area with ~one million inhabitants at present. Many volcanic satellite scoria cones are scattered within the Nyiragongo lava field, and multiple large tuff cones stand distinctly along the Lake Kivu northern shoreline. We report novel detailed stratigraphy of the best exposed tuff cones in that field. Several cones possess multiple craters and vents, and deposits range from block-and-ash breccia's, to consolidated hyaloclastite tuff, ash-and-lapilli tuffs and layers of scoriaceous lapilli and bombs. Depositional contacts suggest distinct eruptive episodes within a single cone, mostly with an undefined time lag in between. Indicators of wet syn-depositional conditions and the occurrence of erosive base surge deposits testify the phreatomagmatic nature of most of the eruptive episodes. Overall, peripheral eruptions of Nyiragongo are concentrated along well-defined alignments related to the Nyiragongo rift zones. Based on the previously reported water

level variations of Lake Kivu, we estimate at least 11 phreatomagmatic tuff cones and maars were constructed along the present Lake Kivu shoreline in the past 10,000 years. Radiocarbon dates of palaeosols formed between eruptive episodes at the Lac Vert maar or below lava flows covering the cone deposits, range between ~150 and ~2,500 years BP. Two previously unreported lava effusion events immediately West of Goma were dated at ~300 and ~850 years BP. In conclusion, cone bedding structures suggest the occurrence of several base surge events in the past 3,000 years, with a plausible devastating impact on the area surrounding the eruptive vents. Due to the current dense urbanisation of the Saké-Goma-Gisenyi area, the intermediary explosive origin of the cones has major implications for the volcanic hazard assessment.

Keywords : Phreatomagmatism, tuff cones, maars, radiocarbon dating