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TITLE

On the origins of intracrateral eruption dynamics at Nyiragongo volcano in the period 2002-2021

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V026 - The storage, transport, and eruption of magma using field observations, laboratory approaches, and modeling

ABSTRACT *(2000 characters without space)*

Among the different types of volcanic eruption, Hawaiian-style eruptions essentially consist in lava flows, lava fountaining or a lava lake, which persist for days to decades. Nyiragongo, in D.R. Congo (Central Africa), is an impressive volcano classified in this category. Standing close to a heavily populated area (~1 million inhabitants), its two last eruptions in January 2002 and May 2021 consisted in rapid lava flows from eruptive fissures on the flank towards the city of Goma (the lava flows in 2002 crossed the city toward the shore of lake Kivu while the last ones in 2021 stopped at the north of the city). Following the collapse of the solidified crater floor few days after the 2002 eruption, the eruptive activity has renewed since 2002-2003 in the form of a persistent lava lake up to the last flank eruption in May 2021, leading also to a collapse. In term of absolute elevation of the bottom crater (hosting the lava lake), it has approximately reached a similar level before the two 2002 and 2021 eruptions (i.e., ~3170 m a.s.l.). The level reached by the lava lake before the third documented flank eruption in 1977 was about 100 m higher. Here we derive accurate elevation measurements of Nyiragongo's crater floor and lava lake surface between January 2002 and May 2021 from radar satellite instruments and a 3D mapping of the crater using a drone survey. The filling of the crater by lava initiated in 2002 maintained up to May 2021 through successive but irregular pulsatory filling episodes. Numerous drops of the lake level also punctuated this long-term building pressure. A combined analysis with seismic records available since late 2015 provides important indications on the origins of the largest lava lake drops as deep magmatic intrusions synchronous to seismic swarms. Positive magma budget within the crater were generally observed during the months preceding such major lava lake

drops between 2016 and 2020, as well as before the last flank eruption. This contribution thus brings new trails for the continuous monitoring of Nyiragongo's volcano and advocates for the importance of multi-instrumental investigations (e.g., with gas measurements) in order to decipher tenuous signs of unrest at open-vent volcanoes, especially for volcanic systems having limited historical data and records, like Nyiragongo.