



Intercomparison of gas emissions from the lava lakes of Nyiragongo and Nyamulagira, DR Congo

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From 25th of October to 5th of November 2014 field surveys were carried out at Nyiragongo and Nyamulagira volcanoes, DR Congo. These two volcanoes belong to the eight volcanoes in the Virunga volcanic chain. They have an altitude of about 3470 m.a.s.l. and 3060 m.a.s.l., respectively. The craters of the two volcanoes lie within a distance of less than 15 km and both have a diameter of about 1000 m and 2000 m, respectively showing a similar inner geometry containing several terraces inside. The lava lake of Nyamulagira is still under formation while Nyiragongo's lava lake is known since more than 100 years with short interruptions after the eruptions in 1977 and 2002. However, also Nyamulagira had a long period of lava lake activity, at least from 1912 to 1938.

Both volcanoes are characterized by low SiO₂ content of their lava, but Nyiragongo being exceptionally low in SiO₂ and with significantly higher alkali content than Nyamulagira. There is a clear distinction between both lavas; a basaltic to tephritic one in the case of Nyamulagira and an often foidite one in the case of Nyiragongo. Also their volcanic activity has differed significantly during the last decades from each other. While Nyiragongo is famous for its permanent lava lake, Nyamulagira is characterized by frequent eruptions, which sum up to more than 40 since 1865.

During our field survey we investigated and compared the gas composition and fluxes of both volcanoes in autumn 2014. The ground - based remote sensing technique - Multi Axis Differential Optical Absorption spectroscopy (MAX-DOAS) using scattered sunlight, the in-situ Multi-GAS-instrument, as well as active alkaline and particle traps have been simultaneously applied at each crater of the two volcanoes during the field trip. Downwind installed DOAS instruments (appendant to NOVAC (Network of Observation of Volcanic and Atmospheric Change)) were used to determine SO₂ emission fluxes. Among others, bromine monoxide/sulphur dioxide (BrO/SO₂) and carbon dioxide/sulphur dioxide (CO₂/SO₂) ratios were calculated to differ between Nyamulagira and Nyiragongo by of about a factor 5 and 3, respectively. Fluxes of major compounds (CO₂, H₂O, SO₂, HCl, HF, HBr) and trace elements (Cd, Cu, As, Pb, Zn, etc.) will be here presented, giving a very detailed view of similarities and differences between the plume of both volcanoes.

The differences in the gas composition of these two plumes will be discussed and with a view on earlier petrological data some possible processes responsible for them will be proposed.