



## **Environmental impact of volcanic emissions at Nyiragongo (DRC)**

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The large amount of trace elements emitted from volcanoes has a strong impact on the close surrounding areas. Nyiragongo Volcano (Democratic Republic of Congo) belongs to the Virunga volcanic chain and is one of the most active volcanoes in Africa. It is characterized by the presence of an active and permanent lava lake with a persistent degassing activity.

During a field trip in October-November 2014, we investigated the impact of the volcanogenic deposition in the surrounding of the crater by using different sampling techniques. Rain-gauges were used to collect atmospheric bulk deposition. Active and passive biomonitoring techniques (moss-bags and leaves of endemic plants – *Senecio* spp. and *Amarantus viridis*) were applied in order to investigate the dispersion of volcanic gas and particle emissions. We collected daily rainfall events at various sites: seven samples at the crater rim (on the western and southern side, 3470 m a.s.l.), one sample at the village Kibati (south-eastern flank, 1955 m a.s.l.) located at the up-wind base of the volcano (representing the local background), and four samples in the city of Goma (southern flank of the volcano, 1500 m a.s.l.). In order to implement our dataset, several samples of rainwater, amaranth leaves, soils and atmospheric depositions (by moss-bags and filters exposition) were sampled after the field trip by the researchers of the Goma Volcano Observatory (GVO). Since, the prevalent wind direction was blowing the plume in westerly or southwesterly direction, we exposed the raingauges in the villages of Bulengo, Rusayo and Kingi in the southwestern side respect to the volcano, and Kibumba in the southeastern as a background site, at increasing distance from the rim. In the same sites, leaves of *Amarantus viridis*, which is one of the principal vegetables eaten by the local population, were collected. Rainwater, moss bags and plant samples were analyzed for major and trace elements by IC, ICP-OES and ICP-MS.

The large amount of emitted volcanic gases and particles includes sulfur, halogens and trace elements, that strongly affect rainwater chemistry and have a widespread impact on the surrounding vegetation of the volcano. Indeed, rainwater samples collected at the rim of the crater have low pH values ( $\approx 3$ ), high concentration of F- and Cl- (up to 12.0 and 12.8 mg/l, respectively) and dissolved toxic elements (such as Al, As, Cd, Cu, Fe and Pb), whereas samples from the city of Goma have pH values above 5 and the same elements show orders of magnitude lower concentrations. The biomonitoring results highlight that bioaccumulation of trace elements is extremely high in the proximity of the crater rim and decreases with the distance from the active craters. The data will be compared to earlier measurements taken in December 2011 and the impact of a slightly decreasing gas emission on the vegetation will be discussed.