The importance of multidisciplinary volcano monitoring: pre- and co-eruptive activity during the Nyamulagira 2010 eruption (D.R. Congo)

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Nyamulagira (or Nyamuragira) volcano, in Eastern D.R. Congo, is one of the most active volcanoes in Africa. This volcano is located in the Virunga National Park, in an inaccessible area currently controlled by rebels. Its study is consequently difficult and recurrent armed conflicts in this region prevent the continuous monitoring of its activity using ground-based techniques. Nyamulagira erupted from 2 to 27 January 2010, during a relatively peaceful period. For the first time in the Virunga, a volcanic eruption was monitored in details using daily field surveys, as well as remote sensing and ground-based geophysical techniques. Based on field observations, eruptive phases were defined. Co-eruptive signals from ground deformation, seismicity, SO_2 emission and thermal flux correlate with these eruptive phases. Clear unambiguous pre-eruptive ground deformations are observed about 3 weeks before the lava outburst. They coincide with small, though clear increase of the short period seismicity and SO_2 emission. These precursors contrast with the only precursory signal previously recognized in the Virunga region, namely the increase of tremors and long period seismicity, which were detected less than two hours before this eruptive event. The 2010 eruption of Nyamulagira illustrates that multidisciplinary monitoring, and consequently collaboration between different disciplines and scientific teams, allows the identification of weak signals and the detection of possible precursors that would have gone unnoticed otherwise.