

The monitoring of seismic activity at Nyiragongo volcano through telemetered seismic network, Goma Volcano Observatory (Democratic Republic of the Congo).

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To monitor seismic activity at Nyiragongo volcano for scientific and civil defense purposes, a new seismic network of seven digital stations were installed on the volcano edifice in 2004. The seismic network was deployed and real time acquisition system was created during the period November 2003 - May 2004.

This study is divided in two different steps: 1) to deploy the telemetered seismic network with a given geometry able to an efficient monitoring of the two local active volcanoes, Nyiragongo and Nyamuragira and 2) to study the seismic pattern, crust structure and stress tensor.

The network is composed by enlarged-band or broadband 3 component sensors, 24-bit A/D converters, GPS synchronization at the remote station, radio modem link on the 444-447 MHz frequency band, solar panels and batteries for power supply at the remote sites, a PC-based acquisition and analysis system. The sensor used in 5 stations is a Lennartz LE3D-5s seismometer, while for the remaining stations, a Nanometrics Trillium broadband seismometer has been adopted. Also the modular acquisition system, GAIA, used in its portable configuration, was specifically developed by the INGV for the GVO. The network has been designed on the basis of recent previous experiences of INGV (Istituto Nazionale di Geofisica e Vulcanologia) in digital seismic monitoring during volcanic crisis occurred in the last years in Italy. In fact, the acquisition software was already used for the first time at Stromboli during the 2002-2003 emergency crisis and it is part of the INGV centralized acquisition software suite in Rome. The safety conditions of the area have forced to install the whole network in safety areas only. GVO personnel specifically built seven concrete buildings, organizing an extremely efficient surveillance service. The first choice for the installation, was thus based, not on the geometry of the network but mainly on the available sites. In fact in the northern part of the volcano, between Nyiragongo and Nyamuragira we could not deploy any station. The digital telemetered seismic network, is currently operating and seismic signals are continuously recorded at the GVO.

Based on seismic data collected from 2004 and on the picked P waves arrivals time of local earthquakes, we constructed the 1D velocity model for the crust beneath the volcano using the VELEST code (Kissling et al., 1995). In better understand how the volcano works, and define its plumbing system, the crust structure and the relationship between regional tectonic and volcanism, we are planning to analyze focal mechanisms (Gephart and Forsyth, 1984), spatial distribution of earthquakes and magnitude of events. These results will be then compared with those available from the historical seismicity that hit this region.

References

Gephart, J. and W. Forsyth (1984): An improved method for determining the regional stress tensor using earthquake focal mechanism data: application to the San Fernando earthquake sequence, J. Geophys. Res., 89, 9305-9320.

Kissling, E., W. L. Ellsworth, D. Eberhart-Phillips and U. Kradolfer (1994): Initial reference models in local earthquake tomography, *J. Geophys. Res.*, 99, 19635-19646.

Figures and captions:

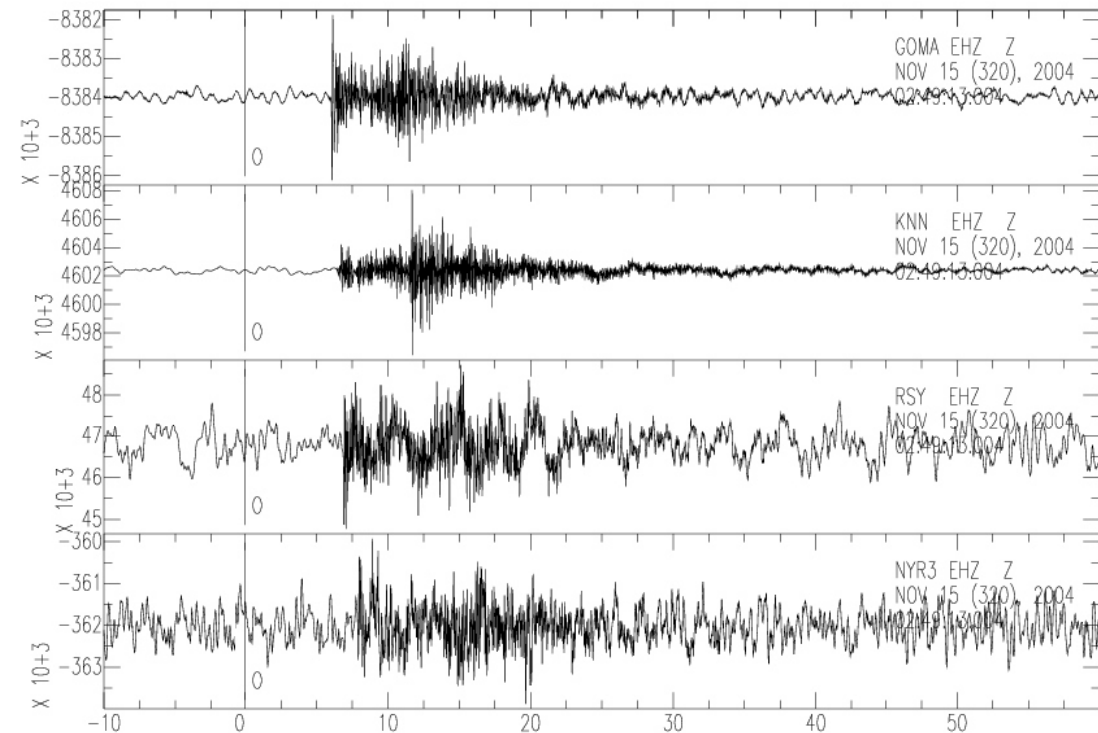


Figure 1.

Some events recorded by the GVO network. In fig. 1 an earthquake located in Tanzania (2003/11/22 01:30:08.69 ML 4.3 also in ISC). In fig. 2 a local earthquake out of catalogues occurred in 2004/11/15 and last fig. 3 a teleseism located in Sumatra (2004/07/25 14:34:29.90 ML 7.1 CSEM 6099493).

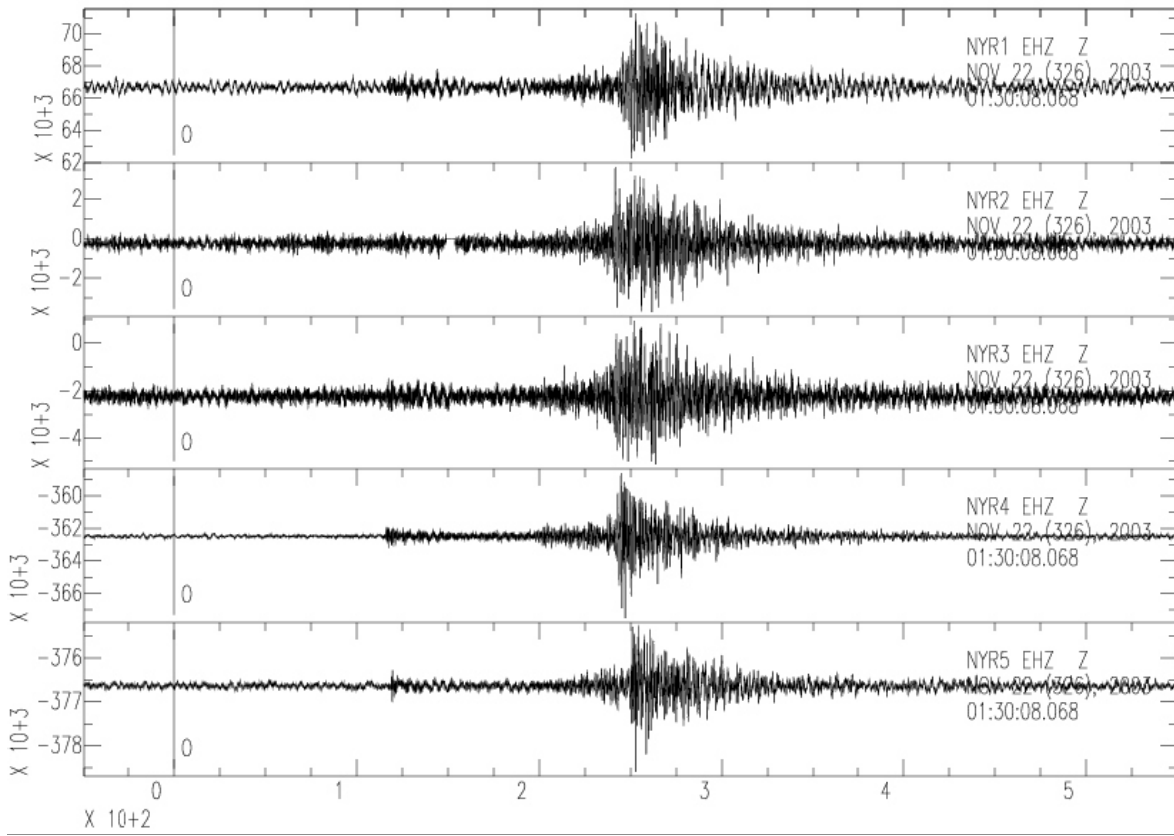


Figure 2.

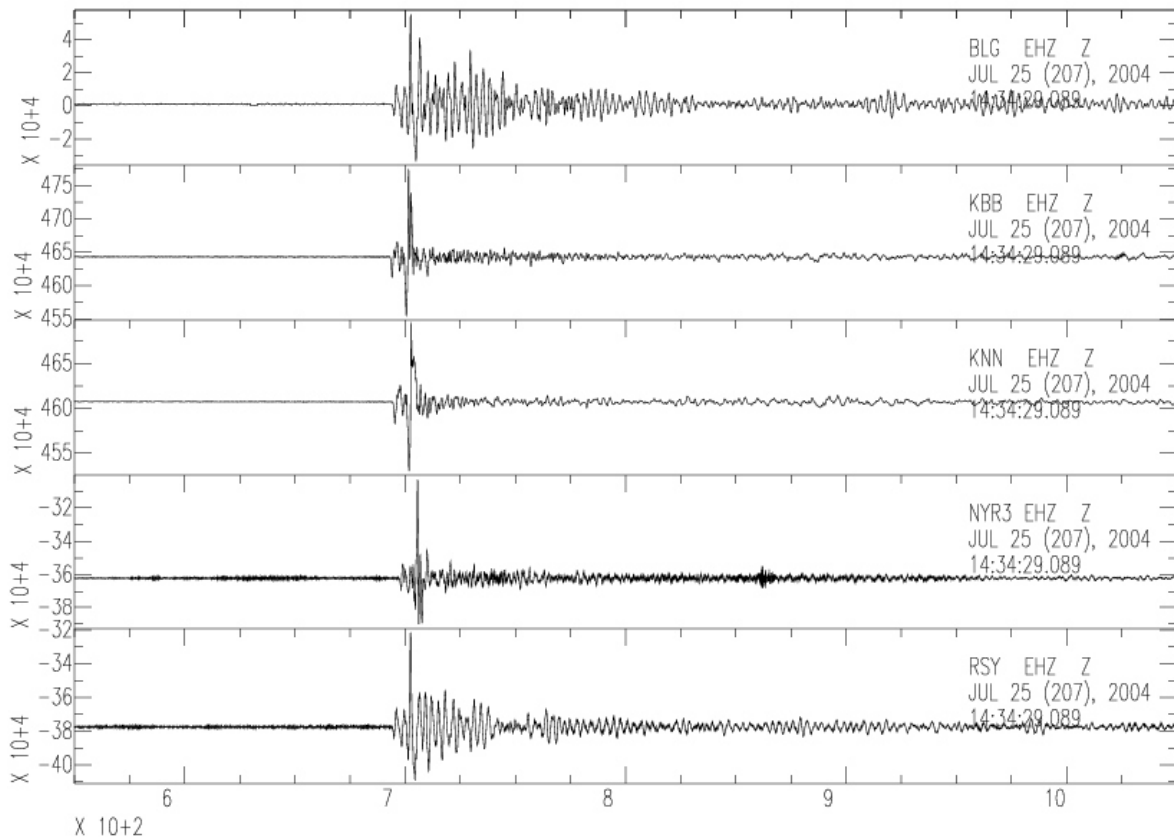


Figure 3.

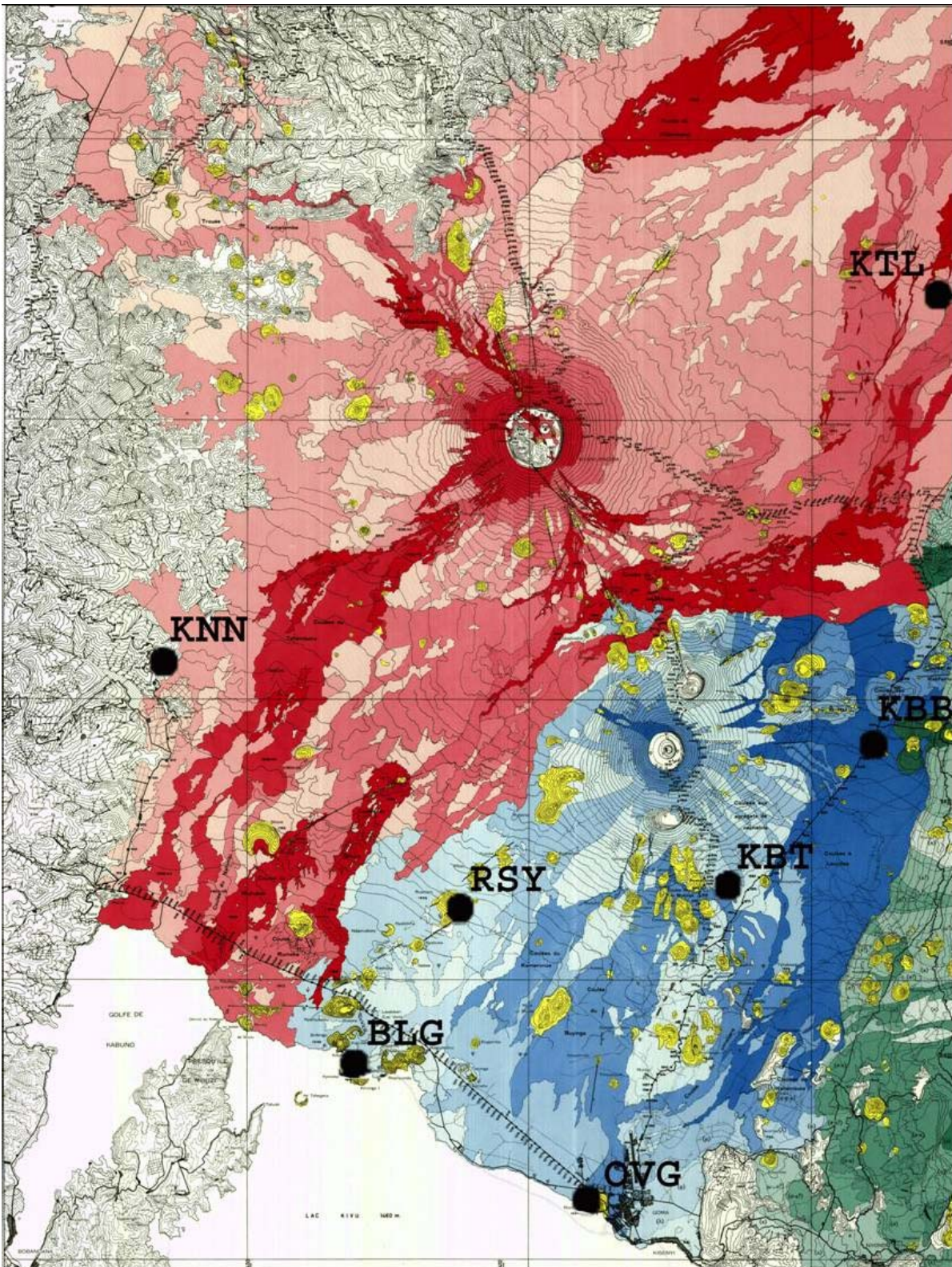


Figure 4. Geologic map of Nyiragongo and Nyamuragira. Data used in this study were provided by the seismographic digital stations of Goma Volcano Observatory composed by Bulengo (BLG), Katale (KTL), Kibati (KBT), Kibumba (KBB), Kunene (KNN), Goma (OVG) and Rusayo (RSY) stations.