

## **Inventory of gas emission rate measurements from volcanoes of the global Network for Observation of Volcanic and Atmospheric Change (NOVAC) - present status of the network and some study cases**

Bo Galle<sup>1</sup>, Santiago Arellano<sup>1</sup>, Ulrich Platt<sup>2</sup>, Gustavo Garzon<sup>3</sup>, Silvana Hidalgo<sup>4</sup>, Yalire Mapendano<sup>5</sup>, NOVAC Partners<sup>6</sup>

<sup>1</sup>Department of Earth and Space Sciences, Chalmers University of Technology, Sweden, <sup>2</sup>Institut für Umweltphysik, University of Heidelberg, Germany, <sup>3</sup>Servicio Geológico Colombiano, Colombia, <sup>4</sup>Instituto Geofísico, Escuela Politécnica Nacional, Ecuador, <sup>5</sup>Observatoire Volcanologique de Goma, D. R. Congo, <sup>6</sup>The NOVAC Team, Global

E-mail: bo.galle@chalmers.se

Measuring the magnitude, intensity and distribution of volcanic gaseous emissions is important for a number of reasons. On one hand, it provides information on the amount of magma involved in an eruption, as well as on the conditions in the conduit and eruptive vent that determine if magma would erupt explosively or effusively. On the other hand, volcanic gases may have an important impact on the surrounding human and natural environment, either directly for the case of acid, corrosive or suffocating species; or indirectly, due to their role in atmospheric chemistry, radiative balance and potentially climate on different scales. Despite of its importance, continuous monitoring of volcanic gases has traditionally not been the major focus of volcanological studies, due mainly to technological, logistical or economical reasons. This situation is changing in recent years, due to the advent of robust, affordable, automatic remote sensing instruments, like the Scanning Mini-DOAS. This instrument is capable of measuring the emission rate of SO<sub>2</sub> emitted by a volcano by the scanning-DOAS method with sufficient accuracy to detect passive emission plumes a few km downwind their sources.

NOVAC, the Network for Observation of Volcanic and Atmospheric Change, was initiated in 2005 as a 4.5-years-long project financed by the European Union. Its main purpose was to implement a global network for the study of volcanic atmospheric plumes and related geophysical phenomena by using the Scanning Mini-DOAS instrument. Up to 2013, 68 instruments have been installed at 26 volcanoes in Central and South America, Italy, Democratic Republic of Congo, Reunion Island, Iceland, and Philippines, and efforts are being done to expand the network to other active volcanic zones. NOVAC has been a pioneer initiative in the community of volcanologists, involving research institutes and volcanological observatories in 18 countries.

We present the results of the batch evaluation of measurements of SO<sub>2</sub> gas emission rates carried out within NOVAC, which for some volcanoes represent a record of more than 7 years of continuous monitoring, with an average of 40 flux measurements every day. The network comprises some of the most strongly degassing volcanoes in the world, covering a broad range of tectonic settings, levels of unrest, and potential risk. Besides showing the present status of the global database, the source strengths and statistical distribution of emissions from the volcanoes in the network, some results of specific studies are presented, including a complete tracking of the recent reactivation of Nevado del Ruiz volcano, the characterization of open-closed degassing regimes of Tungurahua volcano, and the long-term variations of gas emissions from Nyiragongo volcano.