



## Gas Monitoring on Volcanoes - Examples

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### Abstract

On many volcanoes gases from fumaroles are taken and are carefully analyzed by laboratory based instrumentation to study volcanic processes and changing volcanic activity. Sampling intervals are typically in the range of weeks or months short term variations can not be detected. Since a few years we have experience to install and operate technical systems for continuous and automatic measurements of proxies for fumarole gases like CO<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> and for physical parameters such as temperatures and pressures of fluids escaping fumaroles. (Faber *et al.*, 2003, Teschner *et al.*, 2005, 2007). These sensor-based systems are powered by solar panels and data are transmitted continuously by telemetry to observatories. Data sampling rate is adjustable but normally in the range of 5 to 15 seconds. The lengths of operating periods are strongly influenced by the activity of the volcano and by conditions of technical system components. Systems are usually placed very close to a fumarole inside the crater of a volcano, so increasing volcanic activity may cease data acquisition efforts due to ash fallout covering solar panels and/or rocks which are ejected from the volcano, inhibiting power supply and/or destroying the technical monitoring equipment.

Monitoring stations are installed on the volcanoes Krakatau (Indonesia), Nisyros (Greece) and Galeras (Colombia). Some of the experiences we gained will be pre-

sented. The monitoring system installed on the Krakatau volcano (Indonesia) is part of a multi parameter station. Data on time series for this volcano will be presented. Some preliminary results are: concentrations of gases are often below or at the detection limit of sensors, especially for H<sub>2</sub>S and SO<sub>2</sub>. The concentration of CO<sub>2</sub> is at the atmospheric level or even below. Diurnal and semidiurnal variations in CO<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> and fumarole pressure are found. The temperature of the monitored fumarole is low and varies between about 70 – 80°C.

Data of long observation periods are expected to be compared and correlated with the activity state of the volcano and with seismic information. However, due to the nature of the systems (i.e. installation directly in the crater of a volcano) information is available prior to and during the very beginning of an eruption only and supplementing monitoring equipment at some distance around the crater cone is considered to be reasonable.

## References

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