Development of an Infrared Remote Sensing System for Continuous Monitoring of Stromboli Volcano

R. Harig (1), M. Burton (2), P. Rausch (1), M. Jordan (1), J. Gorgas (1), and J. Gerhard (1)

(1) Hamburg University of Technology, Germany, (2) Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Italy

In order to monitor gases emitted by Stromboli volcano in the Eolian archipelago, Italy, a remote sensing system based on Fourier-transform infrared spectroscopy has been developed and installed on the summit of Stromboli volcano. Hot rocks and lava are used as sources of infrared radiation.

The system is based on an interferometer with a single detector element in combination with an azimuth-elevation scanning mirror system. The mirror system is used to align the field of view of the instrument. In addition, the system is equipped with an infrared camera. Two basic modes of operation have been implemented: The user may use the infrared image to align the system to a vent that is to be examined. In addition, the scanning system may be used for (hyperspectral) imaging of the scene. In this mode, the scanning mirror is set sequentially move to all positions within a region of interest which is defined by the operator using the image generated from the infrared camera.

The spectral range used for the measurements is 1600 – 4200 cm-1 allowing the quantification of many gases such as CO, CO_2, SO_2, and HCl. The spectral resolution is 0.5 cm-1. In order to protect the optical, mechanical and electrical parts of the system from the volcanic gases, all components are contained in a gas-tight aluminium housing.

The system is controlled via TCP/IP (data transfer by WLAN), allowing the user to operate it from a remote PC. The infrared image of the scene and measured spectra are transferred to and displayed by a remote PC at INGV or TUHH in real-time. However, the system is capable of autonomous operation on the volcano, once a measurement has been started. Measurements are stored by an internal embedded PC.