Geophysical Research Abstracts, Vol. 9, 08124, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08124

Gas geochemical monitoring system in Furna do Enxofre lava cave (Graciosa Island, Azores)

F. Viveiros (1), T. Ferreira (1), J.L. Gaspar (1), G. Virgili (2) and C. Silva (1)

(1) Centre of Volcanology and Geological Risk Assessment, University of the Azores, Portugal, (2) West Systems Company, Pisa, Italy,

(Maria.FB.Viveiros@azores.gov.pt / Fax +351-296650142)

Graciosa Island is formed by an active central volcano (Caldeira Volcano) and several monogenetic edifices. Furna do Enxofre lava cave located in the Caldeira Volcano is a peculiar structure that is found below the surface of the caldera floor and is interpreted as being the uppermost part of a volcanic conduit.

This lava cave has a diameter of about 150 m and a height of 80 m communicating with the outside by two small openings located along a fault line. A tower with 183 steps was built in one of the openings to access the cave. The cave floor dips towards SE ending in a cold water lake. A mud pool, steaming grounds and an intense soil diffuse degassing area are also present. The singular characteristics of this place turn it in one of the most important touristy sites of Graciosa Island as well as the Azores archipelago.

On August 1992 two visitants died inside this volcanic structure due to the presence of high levels of CO_2 (higher than 15%) near the lake. Ten years later, in December 2002, a monitoring and warning system prototype was installed inside the Furna do Enxofre cave in order to monitor the degassing changes and the environmental conditions. Currently the system is composed by two CO_2 detectors, one located near the lake and other half-way between the lake and the cave entry. A soil flux permanent station (with CO_2 and H_2S detectors) was installed in an intense degassing area. Additionally meteorological sensors were placed in the outside.

During the five years of monitoring the CO_2 concentration values near the lake oscillated between 0 and >20% and in the other sensor from 0 to > 6.6%. The average

of CO_2 and H_2S soil flux values was 10 000 $gm^{-2}d^{-1}$ and 65 $gm^{-2}d^{-1}$, respectively. Seasonal trends were observed for the gas concentrations showing that CO_2 values increases during summer time, always attaining lethal concentrations that can last several months. This situation changes with the weather transition to the winter period when the CO_2 concentration values are always significantly lower. Every time the established CO_2 concentrations threshold levels are reached in the atmospheric air a warning acoustic and visual signal is automatically turned on.

All the acquired data are sent in real time to the Centre of Volcanology and Geological Risk Assessment, located in the University of Azores, S. Miguel Island, by a UHF/microwave telemetry system. Any alarming situation is immediately reported to the Civil Defence authorities.