Geophysical Research Abstracts
Vol. 13, EGU2011-9543, 2011
EGU General Assembly 2011

Estimation of CO2 flux from Lakes Monticchio, Mt Vulture, Southern Italy

Agnes Mazot (1), Orlando Vaselli (2,3), and Barbara Nisi (2)

(1) Department of Volcanology, GNS Science, 114 Karetoto Road, Taupo 3352, New Zealand(a.mazot@gns.cri.nz), (2) Department of Earth Sciences, Univ. of Florence, Via G. La Pira, 4, 50121 Florence, Italy, (3) CNR-Institute of Geosciences and Earth Resources, Via G. La Pira, 4, 50121 Florence, Italy

Crater lakes act as huge condensers of fluids coming from volcanic-hydrothermal systems. Water and dissolved gas composition and the flux of volatiles from lake surface provide valuable information on the gas input from the sub-continental mantle. In quiescent and extinct volcanoes, residual gases from degassing magmatic systems, such as CO_2, may interact with the surficial water bodies and produce vertical chemical stratification (meromictic lakes) that may trigger limnic eruption as those occurred in Monoun and Nyos (Cameroon).

Mt. Vulture, located in the southern Apennines, is the easternmost volcanic district of the Roman Comagmatic Province and is a relatively small igneous complex consisting of lava and tuff sequence and several parasitic cones, eccentric lava-plugs and domes. Basanite, nefelinite, tephrite and phonolite are the main rock types with subordinate melilite-bearing and carbonatitic rocks rocks. The last explosive activity of Mt. Vulture occurred 130 ka ago with the formation of two maar craters (Lakes of Monticchio: Piccolo and Grande). In the last 200 years several gas bursts in the lakes have occurred with the last events occurring between 1810 and 1820 when all the fish living in the Piccolo lake were killed. This lake is permanently stratified because of the presence of a vertical water density gradient with the deep layer not affected by seasonal mixing. A CO_2 flux survey was performed on the surface of both lakes by using the floating accumulation chamber method. During this survey the water at different depth was also sampled for geochemical analysis. The two lakes displayed a significant chemical stratification, mainly consisting of an increase of the HCO_3^- and Ca^{2+} concentrations. The dissolved gas composition was dominated by N_2 in the epilimnion, whereas CO_2 and CH_4 were the main gas compounds in the anoxic hypolimnion. Total CO_2 emission rate from the lakes was estimated to be 0.9 $\pm$ 0.02 t/day (Piccolo lake), and 1.9 $\pm$ 0.04 t/day (Grande lake). The mean CO_2 flux for both lakes was 4 g/m^2/day. The flux measured was quite low and homogeneous but some small areas of the Piccolo lake were characterized by relatively high flux (up to 27 g/m^2/d). The CO_2 fluxes measured at Grande lake were also confirmed by theoretical calculation carried out using an empirical equation similar to the 1^{st} Fick's law equation and the chemical composition of the water sampled. On the contrary, for Piccolo lake a CO_2 flux of 0.2 g/m^2/day was calculated, i.e. more than one order of magnitude lower than that provided by direct measurements. This suggests that the higher CO_2 flux measured on this lake was probably the consequence of another mechanism (i.e. "pockets" of CO_2 coming from the lake bottom to the surface). Further research will be carried out to have a better understanding of the physicochemical processes occurring at Piccolo lake.