Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06391, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06391
EGU General Assembly 2008

Degassing of natural geological CO_2 in central and southern Italy: accumulation at depth and release at surface.

G. Chiodini (1), A. Baldini (2), S. Caliro (1), **C. Cardellini** (2), A. Costa (1), A. Folch (1),F. Frondini (2), D. Granieri (1), N. Morgantini (2)

(1) INGV-Napoli, Osservatorio Vesuviano, Napoli, Italy, (2) Dipartimento di Scienze della Terra, Università di Perugia, Perugia, Italy, (geochem@unipg.it / Fax: +39 0755852603)

Central and southern Italy are affected by an active and intense process of CO_2 Earth degassing. Regional scale studies highlighted the presence of two large CO_2 degassing structures that, for the magnitude and for the geochemical-isotopic features, were related to a regional process of mantle degassing. Quantitative estimates provide a regional CO_2 flux of about 9 Mt/y affecting the region (62000 km^2). This amount is globally relevant being $\sim$ 10% of the present-day global CO_2 discharge from subaerial volcanoes, but it is of low magnitude respect to the amount of CO_2 that is programmed to be injected in the storage sites. Numerous are the evidences of this intense degassing process. The western sector of the region is characterized by the presence of hundreds CO_2 rich gas emission releasing the gas through vents and/or soil diffuse degassing and CO_2 rich groundwaters Recent advances on the characterization of the degassing areas and on the measurement of the gas release showed that relevant CO_2 flux $>$ 100 t/d is released by the 14% of these areas and CO_2 fluxes from 100 t/d to 10 t/d from about the 35%. An on line, open access, georeferenced database of the main CO_2 emissions was settled up during the last years in the framework of the INGV-DPC-V5 project. Most of these CO_2 degassing areas are generally fed by buried, generally carbonate, reservoirs (frequently explored for oil and geothermal energy production), covered by low permeability formations, where the gas produced at depth accumulates before the expulsion at the surface trough geological-structural structures. The possible evolution of some "CO_2 reservoir" was simulated by physicalnumerical modeling by TOUGH2 code. A different scenario characterizes the eastern sectors of northern and southern Apennine. In these sectors, which is characterized by a thicker crust and by a less evolved extensional structures, CO_2 can accumulates in deep crustal traps generating overpressurized reservoirs, even if less surface evidences are present. Existence of such reservoir is supported by the presence of deep well encountering CO_2 at near lithostatic pressures and by indirect observation, such as fluid driven seismogenesis on low angle normal faults of Apennine. A relatively important hazard is connected to the gas released by several gas emissions. In fact, in relation to “favorable” conditions, the gas released can accumulate at the surface forming high CO_2 lethal traps that constitute an hazard for humans and animals, as testified by accidents documented also in the present time. At some test sites the dispersion of the “heavy gas” was simulated by TWODEE code based on a shallow layer approach, considering the local topography, under meteorological conditions and wind speed. The obtained results shows the potential of the applied model for hazard assessment and risk mitigation by simulating the gas plumes released by natural emissions and evaluating where and when lethal concentrations for humans and animal are reached.