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Carbon dioxide and methane gas emanations of volcanic and natural areas in central Italy

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Carbon dioxide and methane are two important greenhouse gases which originate from biological, geological and anthropogenic sources. In the global methane budget reported by the International Panel on Climate Change little emphasis has been given to geological fluxes. However, on a regional Italian scale, geological CO_2 and CH_4 emissions might have comparable or even more relevant role than biogenic sources. For CO_2 most of the natural ecosystems, in fact, behave as sources and sinks depending on the season, with an annual net balance which can be often negative (CO_2 sink). CH_4 fluxes from Italian natural areas are generally negative (soil biological oxidation) and CH_4 emissions are only observed in anaerobic environments such as wetlands and rice paddies, which have a very limited surface in Italy. On the other hand, the Italian region is characterized by a high frequency of geothermal and volcanic areas which might produce significant amounts of the two greenhouse gases. While the role of biogenic sources in the global C budget is well characterized, less data are available for geological CO_2 fluxes and even fewer studies exist for CH_4, and more research is needed to widen the current database. In the present study CO_2 and CH_4 budgets have been estimated in three areas of central Italy, two volcanic (Cava de' Selci and Solforata of Pomezia) and one natural (Solforata of Nepi). CO_2 and CH_4 fluxes were measured over a specifically designed grid, using two different techniques. CO_2 fluxes were obtained by an infrared gas analyzer coupled with a dynamic closed chamber. CH_4fluxes were estimated by using static closed chamber and gas chromatographic analysis (FID).

In the three areas we measured not only fluxes for both carbon dioxide and methane, but we also measured the content and the CH_4/CO_2 ratios. The collected soil gases

were then compared with the same species, contents and ratios, obtained from “fumaroles” emanations and atmosphere in each site, in order to distinguish two “homogeneous” source regions.

Gases from each area where also analyzed for their isotopic content for He, Ar and $\delta^{13}CO_2$. This measurements result necessary to understand the origin of this gas emanations and the tectonic environments where these areas were formed.