



Reducing the Geothermal Exploration Risk by Carbon Dioxide Soil Flux Investigations

Maria Luisa Carapezza (1), Franco Barberi (2), Massimo Ranaldi (2), Tullio Ricci (1), Luca Tarchini (2), Gabriele De Simone (2), Alessandro Gattuso (2), and Mario Silvestri (2)

(1) Istituto Nazionale Geofisica e Vulcanologia, Sezione Roma 1, Rome, Italy (marialuisa.carapezza@ingv.it), (2) University of Roma Tre, Rome, Italy

In the exploration of medium to high enthalpy geothermal resources it happens rather frequently that deep wells find high temperatures but are not productive because they don't cross any permeable fractured reservoir. Because of the high cost of deep drillings, this aspect represents one of the main economic risks of geothermal exploration. A detailed survey of diffuse CO₂ soil flux may allow to identify from the surface the permeable portions of a deep-seated actively degassing geothermal reservoir, drastically reducing this risk. In order to test the effectiveness of CO₂ soil flux as a geothermal exploration tool we selected two volcanic areas north of Rome, Latera caldera and Marta zone near lake Bolsena, both hosting a geothermal reservoir with T>200 °C and where productive and non-productive wells had been drilled in the past. We proved that in both zones productive wells are located on high CO₂ soil flux zones, whereas the not-productive wells are sited on low flux areas. In addition the surveys allowed to identify some as yet unexplored portions of the geothermal reservoirs where future wells should be conveniently located. Use of the same technique in the medium enthalpy geothermal system of Torre Alfina, Central Italy (T=140°C) showed that the presence of a thick impervious rock cover may be very effective in preventing gas leakages from the reservoir to the surface. Promising results have been obtained also by CO₂ soil flux surveys in some geothermal areas of Honduras (Platanares, Azacualpa) and Costa Rica (Las Pailas). Obviously, CO₂ flux cannot provide any estimate of temperature at depth, which has to be assessed with other geochemical or geophysical exploration techniques.