Geophysical Research Abstracts
Vol. 14, EGU2012-10409, 2012
EGU General Assembly 2012

The geothermal potential of the Campania volcanic district and new heat exchanger technologies for exploitation of highly urbanised areas.

S. Carlino, R. Somma, A. Troiano, M.G. Di Giuseppe, C. Troise, and G. De Natale

Istituto Nazionale di Geofisica e Vulcanologia Sezione di Napoli Osservatorio Vesuviano (Italy), Dinamica dei Sistemi Vulcanici, Napoli, Italy (stefano.carlino@ov.ingv.it)

The geothermal research in Campania region (Italy), started since the 1930, and continued until the '80 by the SAFEN, ENEL and AGIP companies. Such exploration activity highlighted that most of the volcanic districts of the Campania Region have a very high geothermal gradient and heat flow. In particular, inside the Campi Flegrei caldera and at Ischia island the geothermal gradient measured inside the deep wells reaches temperatures above 100°C between few tens and few hundreds of metres of depth, while the heat flow varies between 120-160 mWm^{-2} at Agnano and Mofete (Campi Flegrei main drill sites) to more than 500 mWm^{-2} at Ischia island (south-western sector). A general review of the available literature data (temperature at depth, stratigraphic sections, logs etc.) of the deep wells (down to 3 km b.s.l.) allowed us to quantify the geothermal potential (thermal and electric) of such district. The geothermal potential is about 6 GWy for the Campi Flegrei (Mofete and S. Vito sectors) and 11 GWy for the Ischia island (south-western sector) showing a geothermal reservoir with water and vapour dominant respectively. This results in strong potential interest for economic exploitation of the geothermal resource, both in the range of low-medium enthalpy at few hundreds of meters depth and of high enthalpy at depths of 1-2 km.

In this study we try to model the effectiveness of new technologies of boreholes heat exchangers, which would allow to avoid fluid withdrawal, then strongly decreasing the environmental impact. The proposed technology consists of a double-pipe placed in a borehole heat exchange that can work coupled with an ORC. The two pipes, one inside the other, are located in the well in order to transfer the thermal energy to the working fluid during the descent in the external pipe and then go back through the internal pipe properly isolated.

We propose a complete design of the borehole heat exchangers. The design activity is performed on a theoretical basis, and mathematical/physical model are also derived. Besides simple boreholes, heat exchange could be enhanced by fracturing rocks around the well; theoretical simulations for this case are also presented.