Geophysical Research Abstracts
Vol. 19, EGU2017-7059, 2017
EGU General Assembly 2017

The origin of the geothermal anomaly identified in the Barcelona underground (Spain): Future perspectives of this urban geothermal resource

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During the drilling of line 9 of the Barcelona underground (Spain), a geothermal anomaly was detected, in which groundwater temperature was found to be up to 50°C. Previously, during the construction of the Fondo station in Santa Coloma de Gramanet (SCG), temperatures up to 37°C were already detected in this area.
To study the feasibility of a future energy exploitation of the geothermal anomaly, a local and regional study is being undertaken. We present the first results of the new study. The objectives of this study were (1) to understand the flux regime of the hydrothermal system on both, local and large scale, (2) to explain the origin of the identified geothermal anomaly in SCG, and (3) to know the quality of the geothermal potential of the underground resources. To achieve these goals, different numerical models of groundwater flow and heat transport were performed.
The area of study is constituted mainly of low permeability Palaeozoic granodiorites strongly weathered towards the top (lehm). These materials are affected by two sets of faults: the first one consists of porphyry′s dikes with a SW-NE direction and the second fault family which presents a NW-SE direction (Vázquez-Suñé et al., 2016). In the southeast area, the Quaternary deposits of the Besós River delta overlap these Palaeozoic materials. In spite of being a regional model, all these geological features have been incorporated in a complex mesh with more than 2.5 million finite elements. The results obtained suggest that in the case of SCG, the thermal anomaly found on the surface would have its origin in the rapid ascent of the hot water through these fracturing planes.
Understanding the hydrogeothermal operation of the SCG system in detail and its possible temporal evolution will be of great interest for future evaluation, monitoring and management of the geothermal resources found, as well as to understand the interaction of these systems with urban infrastructures.

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