Geophysical Research Abstracts
Vol. 17, EGU2015-2551, 2015
EGU General Assembly 2015

Novel approaches for an enhanced geothermal development of residential sites

Sophie Schelenz (1), Linda Firmbach (1), Haibing Shao (1,2), Peter Dietrich (1,3), and Thomas Vienken (1)

(1) Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany (sophie.schelenz@ufz.de), (2) Technical University Bergakademie, Freiberg, Germany, (3) Eberhard Karls University, Tübingen, Germany

An ongoing technological enhancement drives an increasing use of shallow geothermal systems for heating and cooling applications. However, even in areas with intensive shallow geothermal use, planning of geothermal systems is in many cases solely based on geological maps, drilling databases, and literature references. Thus, relevant heat transport parameters are rather approximated than measured for the specific site.
To increase the planning safety and promote the use of renewable energies in the domestic sector, this study investigates a novel concept for an enhanced geothermal development of residential neighbourhoods. This concept is based on a site-specific characterization of subsurface conditions and the implementation of demand-oriented geothermal usage options. Therefore, an investigation approach has been tested that combines non-invasive with minimum-invasive exploration methods. While electrical resistivity tomography has been applied to characterize the geological subsurface structure, Direct Push soundings enable a detailed, vertical high-resolution characterization of the subsurface surrounding the borehole heat exchangers. The benefit of this site-specific subsurface investigation is highlighted for 1) a more precise design of shallow geothermal systems and 2) a reliable prediction of induced long-term changes in groundwater temperatures. To guarantee the financial feasibility and practicability of the novel geothermal development, three different options for its implementation in residential neighbourhoods were consequently deduced.