Geophysical Research Abstracts
Vol. 14, EGU2012-2859, 2012
EGU General Assembly 2012
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Detection and Quantification of Local Anthropogenic and Regional Climatic Transient Signals in Temperature Logs from Czechia and Slovenia

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The presentation focuses on detection and quantification of the impact of local anthropogenic structures and regional climatic changes on subsurface temperature field. The analyzed temperature records were obtained by temperature monitoring in a borehole in Prague-Spořilov (Czechia) and by repeated logging of a borehole in Šempeter (Slovenia). The observed data were compared with temperatures yielded by mathematical 3D time-variable geothermal models of the boreholes' sites with the aim to decompose the observed transient component of the subsurface temperature into the part affected by construction of new buildings and other anthropogenic structures in surroundings of the boreholes and into the part affected by the ground surface temperature warming due to the surface air temperature rise. A direct human impact on the subsurface temperature warming was proved and contributions of individual anthropogenic structures to this change were evaluated. In the case of Spořilov, where the mean annual warming rate reached 0.034°C per year at the depth of 38.3 m during the period 1993–2008, it turned out that about half of the observed warming can be attributed to the air (ground) surface temperature change and half to the human activity on the surface in the immediate vicinity of the borehole. The situation is similar in Šempeter, where the effect of the recently built surface anthropogenic structures is detectable down to the depth of 80 m and the share of the anthropogenic signal on the non-stationary component of the observed subsurface temperature amounts to 30% at the depth of 50 m.