Geophysical Research Abstracts, Vol. 9, 04310, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04310

Thermal signature of anthropogenic structures on the subsurface temperature field - examples from Slovenia and the Czech Republic

P. Dedecek (1), J. Safanda (1), D.Rajver (2)

(1) Geophysical Institute, Czech Acad.of Sciences, Prague (2) Geological Survey of Slovenia, Ljubljana

We report on a thermal signature of surface anthropogenic structures in the subsurface temperature field documented by repeated temperature logs of two boreholes in Slovenia and in the Czech Republic. The borehole in Łempeter (Slovenia) is situated in a flat urban area, which was developed about 30 years ago, when the sports hall with adjacent parking areas was built in an immediate neighbourhood of the hole. The temperature profiles repeatedly measured three times between the years 2003 and 2006 display a distinct minimum at the depth of 65 m with warming rate of 0,015 °C per year. A detailed 3-D numerical simulation succeeded in explaining the shape of the profile, assuming that (i) the mean annual ground temperature increased by 10 °C beneath the hall and by 5 °C in the adjacent parking areas, where asphalt was substituted for grass and (ii) the thermal conductivity of rock is anisotropic. Two-dimensional cross-section of the subsurface temperature through the urban area surrounding the borehole displays a superposition of temperature fields under the individual buildings and parking areas. The borehole in the Czech Republic is situated on the campus of the Geophysical Institute Prague and its temperature profile has been gauged every year since 1994. The average warming rate observed in the depth of 38 m is 0,028 °C per year. It is evident, that the warming is not only of a climatic origin. Source of the non-climatic component is a building 20 m aside the borehole built about 20 years ago. Detailed 3-D model allowed to separate the climatic and the non-climatic components of subsurface warming.

The successful simulation of the observed transient features in the subsurface temperature field by considering purely conductive regime is an independent proof of a

conductive nature of the heat transfer between the ground surface and the bedrock - an assumption widely used in the borehole climate studies.