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On the role of the Holocene warming for the interpretation of borehole temperatures

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It well known that the use of short boreholes may induce a particular bias in GSTH inversions, mainly due to the choice of the basal heat flow. In order to further characterize this bias, Monte Carlo simulations were employed. For this purpose the forcing was parameterized by a piecewise constant function representing the surface temperature history of the last 100000 a including the LGM and holocene warming. Jointly with this forcing function, also the thermal properties of the subsurface were taken into account, which were assumed to be constant or dependent on temperature. For the resulting set of 4 to 7 parameters, probable values, variances, or bounds were chosen. Both, uniform and normal independent distributions were adopted. From these configurations a large number of realizations and the corresponding synthetic borehole temperatures were generated.

The results show, that the bias resulting from the holocene warming is significant, both in temperature and in heat flow. This has important consequences for GSTH reconstruction, which often imply the decomposition of the temperature profile into a steady-state (i.e., equilibrium), and a transient component. It will be important also to procedures using the simulated effects of surface temperature signals for comparison with borehole measurements.