



Paleoclimate near the Kola deep drilling site: a detailed 3-D inverse modeling study

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Inverting borehole temperatures near the Kola deep drilling site using 1-D models, we find that there is a considerable variability of resulting surface temperature histories (GSTH). Additionally, 3-D forward modeling shows that the local topography may cause groundwater flow which can influence the subsurface temperature field in the order of the paleoclimatic temperature changes. In addition to the temperature log from the SG3 deep borehole, temperature logs from shallow holes are available, as well as a detailed analysis on thermal conductivity. Information on permeability, however, is sparse, and limited to values from the literature.

Therefore, we constructed a local 3-D model as a basis for inverse modeling. This allowed us not only to invert for GSTH, but also to include the three-dimensional distribution of thermal and hydraulic properties as inverse parameters, including basal heat flow. As a result, we obtain uncertainties of the estimated parameters and information on equivalent models. Furthermore, this strategy is able to make statements on the sensitivity in terms of coupling of the different parameters.