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## Borehole climatology: a discussion based on contributions from climate modeling

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**Abstract.** Progress in understanding climate variability through the last millennium leans on simulation and reconstruction efforts. Exercises blending both approaches present a great potential for answering questions relevant both for the simulation and reconstruction of past climate, and depend on the specific peculiarities of proxies and methods involved in climate reconstructions, as well as on the realism and limitations of model simulations. This paper explores research specifically related to paleoclimate modeling and borehole climatology as a branch of climate reconstruction that has contributed significantly to our knowledge of the low frequency climate evolution during the last five centuries.

The text flows around three main issues that group most of the interaction between model and geothermal efforts: the use of models as a validation tool for borehole climate reconstructions; comparison of geothermal information and model simulations as a means of either model validation or inference about past climate; and implications of the degree of realism on simulating subsurface climate on estimations of future climate change.

The use of multi-centennial simulations as a surrogate reality for past climate suggests that within the simplified reality of climate models, methods and assumptions in borehole reconstructions deliver a consistent picture of past climate evolution at long time scales. Comparison of model simulations and borehole profiles indicate that borehole temperatures are responding to past external forcing and that more realism in the development of the soil model components in climate models is desirable. Such an improved degree of realism is important for the simulation of subsurface climate and air-ground interaction; results indicate it could also be crucial for simulating the adequate energy balance within climate change scenario experiments.

[Final Revised Paper](#) (PDF, 3660 KB) [Discussion Paper](#) (CPD)

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