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Repeated temperature logs from Czech, Slovenian and Portuguese borehole climate observatories

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Abstract. Two borehole climate observatories were established in Slovenia and Portugal within a joint Czech-Slovenian-Portuguese project in the years 2003-2005. Together with the older Czech observatory, which has been operating since the year 1994, they monitor air, soil and bedrock temperatures with the aim of studying air-ground coupling and the downward propagation of the surface temperature changes. We report here on repeated temperature logs carried out within 6 boreholes at the sites of the observatories and their surroundings within a time span of 8–20 years (1985–2005). The repeated logs revealed subsurface warming in all the boreholes amounting to 0.2–0.6°C below 20 m depth. The compatibility of the observed temporal changes of subsurface temperature with surface air temperature (SAT) series measured in Prague (since 1771), Ljubljana (since 1851) and Lisbon (since 1856) was checked by comparing repeated temperature logs with synthetic profiles that were calculated using SAT series as forcing functions. The depth of the Czech borehole (140 m) and the Portuguese borehole (180 m) was sufficient for a reconstruction of the ground surface temperature (GST) history of the last 150–200 years. Reconstructed GSTs were compared with the SAT series measured in Prague and Lisbon, respectively. The reconstructed histories reproduce reasonably well the amplitude of the recent warming inferred from the meteorological data, 1–1.5°C above the long-term mean. The depth (100 m) of the four repeatedly logged Slovenian boreholes was too shallow for inversion, but a climatic reconstruction was carried out for a deeper borehole, logged in 2006 and located within 5 km from the Slovenian observatory. The obtained GST history was compared with SAT series from Ljubljana.

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