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Ground versus Surface Air Temperature Trends: implications for borehole surface temperature reconstructions

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Ground and air temperature coupling plays an important role in the reconstruction of past climatic changes from temperatures measured in boreholes. A set of boreholes in southern Portugal have been studied earlier in order to achieve a ground surface temperature history reconstruction. Although ground surface temperature histories can be reconstructed from borehole temperature profiles, their comparison with surface air temperatures is not always direct. In order to take advantage of borehole temperature logs for climatic reconstruction, the present study documents how soil temperatures, recorded in the same region, are coupled with air temperatures. Daily means of air temperature, ground surface temperature and ground temperature at 5 cm and 15 cm depth, recorded in Évora and Beja (southern Portugal), from January 2002 to December 2008, are used in this study. Two other sets of the same variables recorded in Elvas and Estremoz (also in southern Portugal), but with longer time series (between 1997 and 2008) and with data available at 5 cm, 10 cm, 20 cm, 50 cm and 100 cm are also analyzed.