



Inter-annual variations of the mean annual air – ground temperature difference at Caravelinha station in south-central Portugal

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The long-term temperature monitoring of the air (0.05 and 2 m above ground), soil (at depths of 0.02, 0.05, 0.1, 0.2, 0.5 and 1 m) and bedrock temperatures (at depths of 1, 2.5, 5, 10, 20, 30 and 40 m) at borehole Caravelinha near Evora in south-central Portugal (38° 36.0' N, 7° 54.6' W, 330 m a.s.l.) provided temperature – time series on the relationship between air and soil temperatures and its variability on the inter-annual scale, as well as the propagation of seasonal surface temperatures and inter-annual variations into the bedrock. The obtained data allowed an estimate of the mean annual difference between the ground (at a depth of 2 cm) and the air (at a height of 2 m) for the period 2007 – 2010. The difference amounted to +2.62 °C in 2007, +3.01 °C in 2008, +3.68 °C in 2009 and +3.80 °C in 2010. The results indicate that the inter-annual changes of the difference can vary by up to 1 °C and that there is an increasing trend of the difference during the observational period. However, the period is too short to draw conclusions on the long-term stability of the difference, which is crucial for the climatic interpretation of the ground surface temperature history reconstructed from temperature – depth profiles measured in deep boreholes. The same monitoring in the Czech Republic (50° 02' 27" N, 14° 28' 39" E, 274 m a.s.l.) under the similar type of surface (yellowish sand without vegetation in Czechia and whitish gravel with very sparse vegetation in Portugal) yielded the mean annual ground - air difference in the interval 1.5 – 2 °C in the eight year period 2003 – 2010 without any statistically relevant temporal trend.