



Seasonal changes of thermal diffusivity and their effect on heat transfer in soils

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The aim of the work is to describe the effects of seasonal changes of thermal diffusivity (TD) on the thermal regime in shallow subsurface soils. The long term temperature series from observatories at Prague (Czechia), Evora (Portugal) and Malence (Slovenia) were processed by newly improved code which enables a detailed calculation of time changes of TD of the soils. To determine the effect of climate warming of the recent years and to describe the possible effect of TD changes on the temperature-depth profiles, time dependent numerical models were computed.

In the case of Evora, the effect of the TD changes on mean annual temperatures was confirmed. This observatory is located on bare sandy surface and TD in the upper soil layer significantly decreases (up to 50%) in summer months. It is due to local climate, which is typical by alternating winter/wet and summer/dry periods. The negative temperature gradient in the depth of 2-5 cm increases with TD decreasing, the coefficient of determination is 0.6 (2012). The TD decreasing during the summer months substitutes the effect of vegetation and controls the heat transfer to the subsurface.

The climate in Prague and Malence is typical by rainy/snowy periods during the whole year and effect of TD changes in bare sandy soils is only short-term, or even insignificant under grassy surfaces.