Climate of the Past
An Interactive Open Access Journal of the European Geosciences Union

Clim. Past Discuss., 3, 337-364, 2007
www.clim-past-discuss.net/3/337/2007/

Variations in air and ground temperature and the POM model: results from the Northern Hemisphere

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Abstract. The POM model for comparing air and ground temperatures is based on the assumption that surface air temperature (SAT) records provide a good prediction of climate induced thermal transients in the shallow subsurface of the Earth. I explore the sensitivity of this model to surface forcings at time scales appropriate for climate reconstructions. I find that the misfit is sensitive to periods longer than about 20 years, is a maximum when the period and the length of the time series are equivalent and then decreases for longer periods. The pre-observation mean (POM) is relatively insensitive to periods equal to the length of the time series. Sensitivity increases for periods greater than the length of the forcing time series. The POM is significant as long as air and ground temperatures faithfully track each other, and these tests provide a method for assessing this assumption. The sensitivity of comparisons between the average Northern Hemisphere gridded SAT record and subsurface temperature depth-profile as a function of forcing period is assessed. This analysis indicates that the average SAT and reduced temperature-depth profile is in good agreement. Some improvement in misfit can be made by decreasing the amplitude of the forcing function at intermediate periods but this effect has negligible influence on the POM. Thus, the joint analysis of borehole temperatures and SAT records indicate warming of about 1.1°C over the last 500 years, consistent with previous studies.

Discussion Paper (PDF, 690 KB) Interactive Discussion (Closed, 3 Comments) Final Revised Paper (CP)

Citation: Harris, R. N.: Variations in air and ground temperature and the POM model: results from the Northern Hemisphere, Clim. Past Discuss., 3, 337-364, 2007. Bibtex EndNote Reference Manager