

## ***Interactive comment on “Transfer function models to quantify the delay between air and ground temperatures in thawed active layers” by E. Zenklusen Mutter et al.***

### **Anonymous Referee #2**

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This paper provides a statistical analysis of a relatively small data set, and a qualitative interpretation of the results in terms of underlying physical processes. I find it difficult to evaluate this paper on its own terms, given that physically based approaches are usual for this type of study. In its current form, the bulk of the paper concentrates step by step on the application of the statistical method. I think the analysis of results needs to be strengthened before this paper can be accepted.

We know that this is a system that is controlled by seasonal, synoptic, and daily cycles, with diffusion mediated by spatially/temporally variable heat and mass transfer. Given that the authors suggest a number of analyses as a next step: (quantitative physical

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analysis, a study of the depth-dependence of time lags), I think it would be appropriate to include a preliminary physical analysis as part of this paper's discussion, to allow for comparison of physical and statistical parameters.

As a first step, the data have been reduced to daily means. (P 2939, lines 18-21: It is unclear that the authors mean by "these discrepancies have not been taken into consideration". Are the data included in the analysis?) As a result, a daily time step is the smallest increment for analysis, which is somewhat crude for a physical analysis at these time/distance scales. What was the frequency of measurement for the ground temperatures? Are the daily mean air temperatures based on hourly values or on daily maxima/minima? Only daily mean data are presented, so that it is difficult to judge whether any diurnal temperature signal remains in the ground temperature data. I would expect that a diurnal signal is apparent at sites with lags of 1-2 days. Analysis might also be possible with a running 24-hour-average time series based on the measurement frequency, allowing for a more precise estimate of the lag time in the ground.

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Interactive comment on The Cryosphere Discuss., 5, 2935, 2011.

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5, C1633–C1634, 2011

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