

***Interactive comment on “Spatial distribution of Pleistocene/Holocene warming amplitudes in Northern Eurasia inferred from geothermal data” by D. Yu. Demezhko et al.***

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General comments

The paper presents an attempt to generalize information on the amplitude of the Pleistocene/Holocene warming (PHW) in Northern Eurasia inferred from geothermal data, which accumulated within the last decade. The addressed problem suits very well orientation of the journal.

The generalization is based on the fact that the available estimates of the PHW amplitudes seem to increase not with a latitude, but display an asymmetric increase in the northwest direction. To quantify this qualitative impression, the authors tried to fit the

PHW pattern with a parametric mathematical model assuming existence of a warming centre, from which the PHW amplitude drops as a function of a distance. The best model, which explains more than 90% of the observed PHW amplitude variation, suggests the amplitude to be indirectly proportional to the distance from the centre located over the North Atlantic. The authors suggest a physical explanation for it, namely “the heat flow from a point source in a thin flat layer with the temperature anomaly  $\Delta T$  linear in the flux”. It is shown, however, that the model fits the data fairly well as long as the position of the warming centre is located in a wide N-S trending zone northeast off Iceland. It invokes a possibility that the warming zone rather than the warming point could be responsible for the observed pattern of the PHW amplitudes and could be identified with the North Atlantic warm currents that resumed to exist at the end of the last ice age.

The northwest trend of the PHW is not observed in the Arctic Asia, north of the 68th parallel, where the amplitude decreases with increasing latitude, reaching zero or even negative values. As an explanation of this unexpected feature, the authors suggest a combination of a warming effect of Late Pleistocene ice sheets and of relatively warm-water lakes that formed repeatedly in the estuaries of big Siberian rivers by damming of the ice released in the rivers' upper reaches in the south.

The proposed hypothesis about the North Atlantic warming centre is nice and to a certain degree justified by the fact that this area represents the largest positive circumpolar temperature anomaly for that latitudes. The main problem is a small number of data, which do not cover the crucial areas of Western Europe and Scandinavia. The very instructive (Fig.5 and especially Table 5) and elegant analysis of the ice sheet cover influence on the ground surface temperatures shown in the paper suggests that the yet non-existing PHW amplitude data from Scandinavia might reveal a large scatter of values, even if the proposed trend in the un-insulated ground temperatures or surface air temperatures were true.

The paper meets the Climate of the Past quality requirements.

## Specific comments

Contrary to the authors, I would be very careful in using the spatial distribution of the PHW amplitude shown in Fig.4 as a basis for the terrestrial heat flow paleoclimatic corrections, especially in Scandinavia and Western Europe, where the PHW pattern is based on a pure extrapolation. In addition to that, the suggested PHW trend could have been strongly modified by a glacial effect in Scandinavia.

I suggest to omit two sentences on page 616, lines 14-17 “The only possible such source.. ..redistribution of solar energy” and to begin the following sentence like “One such a source could be provided by hypothesis of Karnaukhov (1994)”. I do not understand the logic of the two sentences. Even if there were solar activity variations, they would not solve the problem of the additional heat source in the Northern Siberia.

## Technical corrections

Table 2 lacks explanation of the last column, which definitely does not contain the references as mentioned in its heading.

The sentence on p.609, l.13 would make more sense, if instead of expression “..separate qualitative..” contained “..separate high quality..”

I am not sure if I understand the sentence beginning on p.613, l.19, “This warming influence increases with the snow cover height and the amplitude of annual air temperature fluctuations, and decreases with the mean annual air temperature” properly, but if so, I suggest to change it like “This warming influence increases with the snow cover height and with the amplitude of the seasonal air temperature variation, and decreases with the increasing mean annual air temperature”

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