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Spatial distribution of Pleistocene/Holocene warming amplitudes in Northern Eurasia inferred from geothermal data

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Abstract. We analyze 48 geothermal estimates of Pleistocene/Holocene warming amplitudes from various locations in Greenland, Europe, Arctic regions of Western Siberia, and Yakutia. The spatial distribution of these estimates exhibits two remarkable features. (i) In Europe and part of Asia the amplitude of warming increases toward the northwest and displays clear asymmetry with respect to the North Pole. The region of maximal warming is close to the North Atlantic. A simple parametric dependence of the warming amplitudes on the distance to the warming center explains 91% of the amplitude variation. The Pleistocene/Holocene warming center is located northeast of Iceland. We claim that the Holocene warming is primarily related to the formation (or resumption) of the modern system of currents in the North Atlantic. (ii) In Arctic Asia, north of the 68-th parallel, the amplitude of temperature change sharply decreases from South to North, reaching zero and even negative values. These small or negative amplitudes could be attributed partially to a joint influence of Late Pleistocene ice sheets. Using a simple model of the temperature regime underneath the ice sheet we show that, depending on the relationship between the heat flow and the vertical ice advection velocity, the base of the glacier can either warm up or cool down. Nevertheless, we speculate that the more likely explanation of these observations are warm-water lakes thought of have formed in the Late Pleistocene by the damming of the Ob, Yenisei and Lena Rivers.

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