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## Large-scale coherence in the response of lake surface-water temperature to synoptic-scale climate forcing during summer

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**ABSTRACT:** Daily mean lake surface-water temperatures (LSWTs) measured in Swiss Alpine lakes in summer and early autumn 2000 were compared with LSWTs measured simultaneously in Lake Balaton, Hungary, 750 km to the east. The Swiss lakes are small (0.0043-0.46 km<sup>2</sup>), predominantly oligotrophic, and are located in a mountainous environment, some at altitudes >2,000 m above sea level, whereas Lake Balaton is a large (593 km<sup>2</sup>), shallow, mesotrophic lake situated in the much lower-lying Carpathian Basin. Despite the large distance separating the two regions and the extreme differences in character between the lakes, the LSWTs in Switzerland and Hungary exhibited a coherent response to synoptic-scale meteorological forcing, expressed in terms of exponentially smoothed air temperature, which can be viewed as a causal forcing variable in its own right and as a proxy for other forcing variables with which it is correlated. The coherent response of LSWT in very dissimilar lakes in two different geographical regions of Europe demonstrates that largescale climatic forcing on synoptic timescales is much more important for lakes than previously thought. This appears to be particularly true for low-altitude lakes, whereas lakes at higher altitudes exhibit more heterogeneity in their response.

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