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What drives the δ18O signal in European carbonates during LGM and Termination II – multi-archive approach revised

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Due to their natural occurrence in a wide spectrum of environmental settings (marine, lacustrine, terrestrial) carbonates constitute one of the most widely used archives of (paleo)environmental information Although the thermodynamic laws controlling isotopic fractionation are universal, each of the different environments leaves its characteristic imprint on the carbonate chemistry. Consequently, individual carbonate-based records are a combination of regional-scale and archive- or site-specific factors. Environmental heterogeneity, even within a confined geographical area, remains a challenge in teasing out the regional or local nature of the recorded climatic signal. Similarly, interpretation of new data often pays tribute to outdated assumptions.

Here we compare and contrast published oxygen isotope records from different archives (lake sediments and stalagmites) from central Europe and the Black Sea region covering the time span between 26 and 8 ka BP. This exercise aims at (1) identification of the regional-scale mechanisms responsible for common trends and (2) better understanding of archive- and site-specific factors accounting for differences in the records. Additionally, this approach allows for testing 'closed vs outflowing' scenarios for the glacial Black Sea basin.

It appears that changes in isotopic composition of atmospheric precipitation are a common denominator for the analyzed records. Site-specific factors include moisture source (stalagmites) and volume of the basin (lakes). Both, comparison of available geochemical records and data-based theoretical calculations suggest that since the LGM and until reconnection with Mediterranean at ca. 8 ka BP the Black Sea was an open system.