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Tracing past shifts of the boundary between maritime and continental climate over Central Europe

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European climate is characterized by heterogeneous climate conditions, with distinct boundaries between zones that can be classified according to the Köppen classification (Peel et al. 2007), and detected using climate network techniques (Rheinwalt et al. 2016). These boundaries are not stationary, but shift geographically, depending on large scale atmospheric conditions.

Central European climate is strongly influenced by intricately linked North Atlantic Oscillation and Siberian High (SH), which govern precipitation and temperature over Europe. Shifts of these climatic boundaries in response to global warming and circulation changes might lead to more frequent extreme weather patterns like heat waves, with significant repercussions for society (Cohen et al. 2014).

Speleothem-based palaeoclimate reconstructions enable us to understand underlying forcing mechanisms and speed of climatic reorganizations. Here we present a first reconstruction of multi-centennial shifts of the boundary between western European maritime Cfb climate and continental Dfb climate through the last ca. 5,000 years using speleothems from Bleßberg Cave, Thuringia, Central Europe.

Thanks to its location near the Cfb-Dfb climatic boundary, Bleßberg Cave is ideally suited to reconstruct past W-E shifts of this divide longitudinally crossing Central Europe. We compare a decadally resolved stalagmite $\delta^{18}O$ record with data from Bunker Cave (Mischel et al. 2017), western Germany, and an NAO reconstruction from Greenland (Olsen et al. 2012).

Over the last 5,000 years, the boundary between Cfb and Dfb climate shifted repeatedly. When the Cfb-Dfb border was east (west) of Bleßberg (Bunker) Cave maritime (continental) climate prevailed at both sites. Discrepancies between investigated proxy records are found when the boundary is located between the two caves. Comparison with the Greenland NAO record shows that a westerly shifted boundary is often associated with a strong SH and a negative NAO. An easterly shift, in contrast, is found to be linked with weak a SH and a positive NAO.

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