

Application of TEX₈₆ Paleothermometer to Speleothems as an Approach to Reconstructing Interglacial Climate Over the Korean Peninsula

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Speleothem research has been instrumental in furthering our understanding of past climate dynamics through stable isotope, clumped and fluid inclusion analysis. Relatively new methodologies have begun to focus on organic biomarkers in speleothems originating from soil, vegetation or microbial sources. Of particular interest are glycerol dialkyl glycerol tetraethers (GDGTs), a type of archaeal-derived lipids that have potentially high concentrations at the speleothem surface. Interestingly the ratio of GDGTs structures present is temperature dependent thus allowing for application of the iGDGT index of TEX₈₆ to reconstruct past cave air temperature. Assuming drip water temperature is in equilibrium with bedrock temperature, such results can be extrapolated to consider surface temperature. Here we apply TEX₈₆ analysis to two stalagmites that grew during the interglacial periods of marine isotope stage 7, 9, and 11 to study surface temperature over the Korean peninsula on orbital time-scales. By coupling the TEX₈₆ paleotemperatures with speleothem fluid inclusion, carbonate stable isotopes, it allows for more robust interpretations of climate proxy data. This approach leads to a more thorough understanding of the role of temperature in regional climate dynamics of the East Asian Monsoon system, but also its relationship with insolation. With this multiproxy approach we demonstrate the utility of TEX₈₆ analysis.