

Speleothems Reveal 500,000 year history of Siberian permafrost

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Speleothems from caves in Mongolia and Siberia are a powerful archive of environmental changes. Of particular interest in light of global warming are permafrost dynamics and changes in Asian moisture distribution. Speleothems grow only when water is available; permafrost or drought would inhibit growth, recorded as hiatuses in the samples. Our Oxford-led team of speleologists and geoscientists collected and dated speleothems from caves distributed along a N-S transect from S Mongolia to N Siberia to reconstruct dynamics in the spatio-temporal distribution of permafrost. The results are striking: While in caves located in mid-latitudes, permafrost thaw is recorded during each interglacial, northern caves (ca. 60°N) have constantly been covered by permafrost since ca. 420.000 years ago. This is also the last time that speleothems grew in caves in the Mongolian Gobi desert, indicating that the super-interglacial MIS 11 was characterized by a northward retreat of the permafrost and a stronger Asian summer monsoon. This result also suggests that an increase of global mean temperature by ca. 1.5°C is sufficient for substantial northward permafrost migration and stark changes in Asian moisture regimes.