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European atmospheric dust fluxes over glacial time scales: A 500 ka speleothem palaeoclimate record from Gibraltar.

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This paper explores the identification of dust traces in a speleothem palaeoenvironmental record and its ability to provide an insight into past atmospheric circulation and dust transport processes. The study is based on a speleothem (flowstone) from New St. Michaels Cave, Gibraltar with growth spanning over 500 ka to present. Gibraltar offers a unique vantage point to observe the effects of varying oceanic and Saharan dust influxes into Southern Europe.

Long range dust sources and palaeoatmospheric circulation is investigated through $^{87}Sr/^{86}Sr$ analysis. In addition to Sr isotopic data, δ18O, δ13C and a range of trace elemental data is presented to compare aeolian dust transport to palaeoclimate and palaeoenvironmental conditions over multiple glacial cycles. All data is presented with geochronology from a precise U-Th dated age model.

Significant $^{87}Sr/^{86}Sr$ shifts (0.70867 to 0.70897) are observable, indicating large scale long term atmospheric dust source and transport changes. Long term $^{87}Sr/^{86}Sr$ changes correlate with stable isotope data highlighting the interaction between climate and dust production, transport and speleothem incorporation. The paper also explores the mechanisms of Sr dust signal deposition, speleothem incorporation and the potential for direct Sr deposition to speleothem surfaces.