Paleoclimatic Context Of The Origins Of Modern Humans in South Africa: Based on Speleothems Isotopic Records

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Little is known of paleoclimates and paleoenvironments from terrestrial sources over the last 400,000 years in the southern latitudes of Africa. This region is critical to many research agendas, including correlating northern and southern Hemispheric climatic shifts, as well as understanding the environmental context for the origins of modern humans. Our study, focusing on the south coast of South Africa near Mossel Bay, is using a multi-proxy approach to this problem.

Caves have been cut by high sea levels into fault breccias of the Skurweberg Formation of the Table Mountain Group (quartzitic sandstone of Odovician age), which is overlain by fossil shelly dunes and calcretes of Late Quaternary age. Dunes that formed on the now-submerged continental shelf during regressed seas once sealed these caves, and then were eroded by high sea levels, revealing speleothems of various forms and ages. Some of these caves were occupied by early modern humans and studies of the speleothems potentially provide important insights into the climate at these times.

High resolution dating shows that speleothems formation was active during several phases. Among them was a major growth periods between 90 to 50 kyr, characterized by speleothems deposition in isotopic equilibrium with rapid $\delta^{18}O$ fluctuation within a range of -5.5‰ to -2.5‰. $^{87}Sr/^{86}Sr$ vs. 1/Sr falls on a mixing line with Sr isotopic ratio end members of 0.70920 and 0.70940 with ~1000 and <500 ppm Sr respectively. These variations match changes in $\delta^{18}O$ values with $^{87}Sr/^{86}Sr$ ratios being closer to the marine value when $\delta^{18}O$ values are maximal. Several factors could have been responsible for these correlations including frequent climate oscillations observed in northern latitudes, sea level fluctuations and changes in the dominance of the Aghulus and Benguela currents.