

## **Windows into the past: Speleothems from the South African hominin cave sites as palaeoclimate records**

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The area known as the 'Cradle of Humankind' situated about 40 km north of Johannesburg in South Africa is famous for the early human (hominin) fossil remains recovered from numerous cave sites.

The dating of these cave sites and the fossils preserved within them has been a major challenge. However, progress in U-Pb dating of speleothems, in this case flowstone layers sandwiched between the fossil bearing sediments, has gone a long way in providing a chronology for these sites and our early human ancestors.

So far five cave sites have U-Pb dated flowstones and from this new U-Pb dataset, a pattern of contemporary flowstone development emerges, with different caves recording the same flowstone-forming event. This suggests a regional control over the nature and timing of speleothem development in cave deposits.

The flowstones themselves are also archives of palaeoclimate data and in theory could provide records analogous to stalagmite archives encompassing much younger time periods. However, this approach is complicated by the fact that, at present, it is only possible to date one layer of each flowstone. Consequently, top and bottom ages cannot be obtained, and alongside the apparent non-continuous growth of these formations it can be difficult to assess the amount of time recorded by the growth intervals and the extent of any hiatuses.

A 700 mm stalagmite from Wonder Cave, also within the Cradle, was collected in an attempt to overcome the flowstone problem. This sample is Holocene in age and U-Th ages indicate it grew from ~7 ka to 4.3 ka and while there are clear growth layers, no breaks are visible. As such, this stalagmite represents a remarkably high resolution record of around 2500 years and the stable isotopes, drilled at 1 mm, will provide a sub-decadal palaeo-environmental record. An understanding of the speleothem record from the recent past will pave the way to unravelling the much older flowstone signals and enhance our understanding of the palaeoenvironments in which our early ancestors lived and died.