ABSTRACT

The Bahamian Archipelago, because of the young age of its surficial rocks, 100% carbonate geology, and tectonic passivity, has long been used as a test of Quaternary glacioeustatic sea-level highstand position and chronology. With the exception of Mayaguana Island, which displays slight vertical rotation to the south exposing much older units, fossil coral reef U/Th dates from the archipelago all fall within the MIS 5e time window, ~120 ka. It has been argued that older corals formed either below modern sea-level elevation (MIS 7), or have been taken below modern elevation by isostatic subsidence of 1 to 2 m per 100 ka (MIS 9, 11, etc.). Flank margin cave position, on average at 0 to 6 m elevation, and a scattering of stalagmite dates less than 120 ka, supports a MIS 5e origin interpretation for the caves. In contrast, some caves, primarily in the southern Bahamas, display phreatic dissolution at elevations up to 17 m above sea level, and a stalagmite from Conch Bar Cave on the Caicos Platform was recently dated by U/Th to 266 ka. These observations suggest a lack of subsidence, or perhaps mild uplift, in the southern Bahamas. If so, where are the pre-MIS 5e fossil corals and related subtidal deposits? An often overlooked aspect is the karst denudation rate. Work on Guam in the western Pacific discovered 5 m of landscape denudation of a MIS 5e reef, extrapolating that rate of 5 m per 100 ka to the Bahamas (and accounting for climatic differences) suggests that those older reefs are entirely denuded, and that the remaining sea-level signature is preserved only in remnant flank margin caves, formed within the eolian high ground topography, which allowed survival to the present.

THE QUESTION

1. The cave data suggest pre-MIS 5e uplift in the southern Bahamas
2. Where are the pre-MIS 5e fossil coral and related lagoon deposits?

OBSERVATIONS

North and Central Bahamas:
1. All fossil corals date to MIS 5e (115-124 ka)
2. Flank margin caves mostly at 0 to 6 m asl
3. Caves contain stalagmites of ages <120 ka

Southern Bahamas and Turks & Caicos:
1. All fossil corals date to MIS 5e (115-124 ka)
2. Flank margin caves commonly up to 12 m asl or higher
3. Caves contain stalagmites with ages up to 266 ka
Calculated Denudation Rate:
0.05 – 0.12 mm/yr
or
50 – 120 mm/ka

8 m
5 m

8,000 mm : 125,000 yr = 0.064 mm/yr

Figure 9: The Guam data, utilizing both karrentisch and coastal notches (likely breached flank margin caves), indicates denudation of meters per hundred thousand years.

For the Turks and Caicos, the presence of MIS 5e fossil corals and subtidal deposits below 4 m asl indicates minimal uplift in the last 120 ka.

Stalagmite U/Th ages older than MIS 5e, and flank margin caves at up to 17 m asl indicate uplift before MIS 5e, with loss of pre-MIS 5e fossil corals and subtidal deposits to karst denudation of up to 10 m.

CONCLUSIONS

Karst processes, by creating flank margin caves in the subsurface, preserve a record of former sea-level position that those very same karst processes remove from surface outcrops.

Acknowledgements: Nancy Albury, John Jenson, Michael Lace, and Blaz Miklavic for outstanding field assistance.