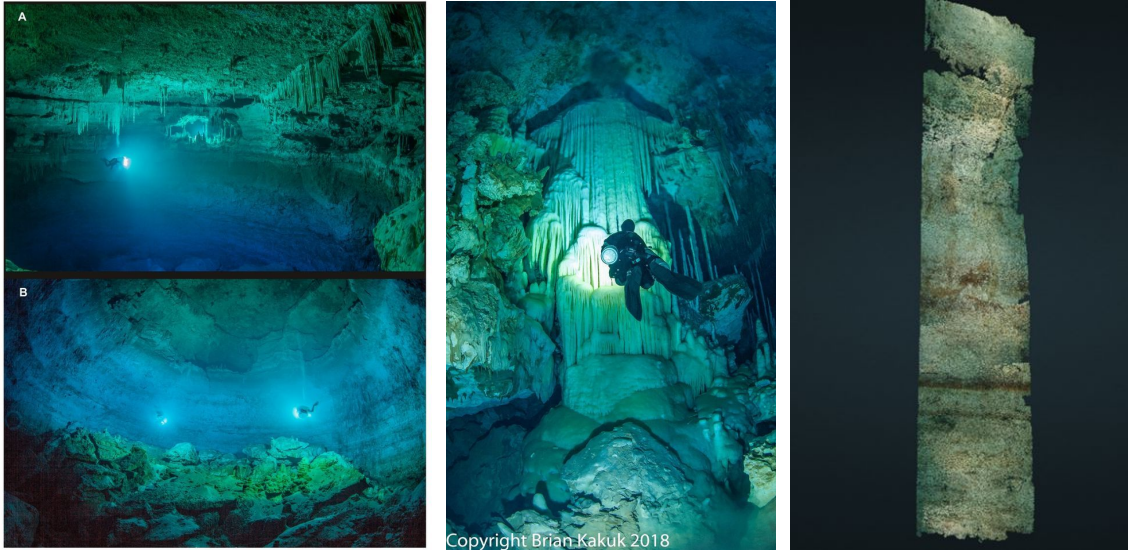


Under the Jungle - Geo Karst challenge - Sunday Sept 6

Colors in the caves!

BATHTUB RINGS! It is common to find horizontal stripes on the cave walls, sometimes encircling an entire chamber. Dr. Beddows is super interested in them, but what makes these colorations so important? Are the rings from past surfaces? Are they just colors like tannic stains, or is it actual different rock? Hydrogen sulfide? Are they always black? What exactly is staining the rock, and what do these colorations tell us about the history of the cave? Are they always in shallow caves, or can they be found in deep places as well?



What are the bathtub rings?

There are thin layers of speleothem calcite deposited around the water, that is precipitated on the walls and already existing speleothem - which means that above them was air that could take the CO₂ off-gassing from the water. Just like all speleothem - they are often white - but can also be colored by organic compounds.

Since they form along what water table - they are deposited perfectly horizontally at the time.

They can be super thin - or can even cover 1+ m band.



Check out these great examples from Christin from Chac Mol

Since the water table goes up and down with the sea level between glacial/interglacial times and also with climate variations - there can be many bands in a given site - and REPEAT BANDS CAN BE SUPER-IMPOSED.

Each layer is an individual record of the paleo-water table.

The bath-tub rings are not the only horizontal feature in the caves..... The sedimentology is most horizontal in the Yucatan.

Since the Yucatan Peninsula is a carbonate platform that remains mostly in the position that the sediments were laid down - the sediments are also in bands that are nearly (but not perfectly) horizontal.

In this picture from [Martin Pollizotto](#) you can see layers in the wall rock - but that is actually the rock. You can also see (if the picture is actually "flat") that the layer on the left side are a bit lower than the matching layer on the right side. The sedimentology in this site is not perfectly horizontal.



To tell if you are really looking at a bathtub ring - get very close.... (and use dental pick!)

Once you get super close - you can see that the ring is a thin layer on top of the rock, and so the surfaces are rounded and smoother due to this literal blanket of speleothem calcite.

FYI - If one gets extreme (e.g. for science) then rock samples will include the outcoating ring speleothem that can be VERY carefully picked off with dental picks using a dissecting microscope. It is also necessary to keep the orientation of the rock sample so that you know which way is UP.

Open section of The Pit - thanks Christine! And especially for taking such a great geology shot!



Any water table will do - so these rings also form away from cenotes.

Indeed - Sarah Landau's photo shot upwards through 30 m of water shows a dark ring in a ceiling dome.

At low sea level or under dry climate - the water table is lower and the domes that extend to shallow depth are air filled. If the CO₂ can escape such as through a tree root hole, then conditions can be perfect for ring formation.



Colors vary - as with all speleothems.....

This gorgeous brown/orange example shows this beautifully.

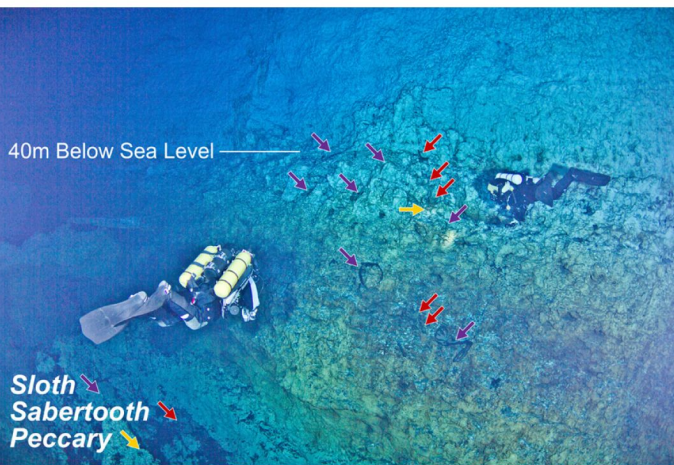
Thanks Eli Wolpin and Natalie for that one. Liking the horizontality!



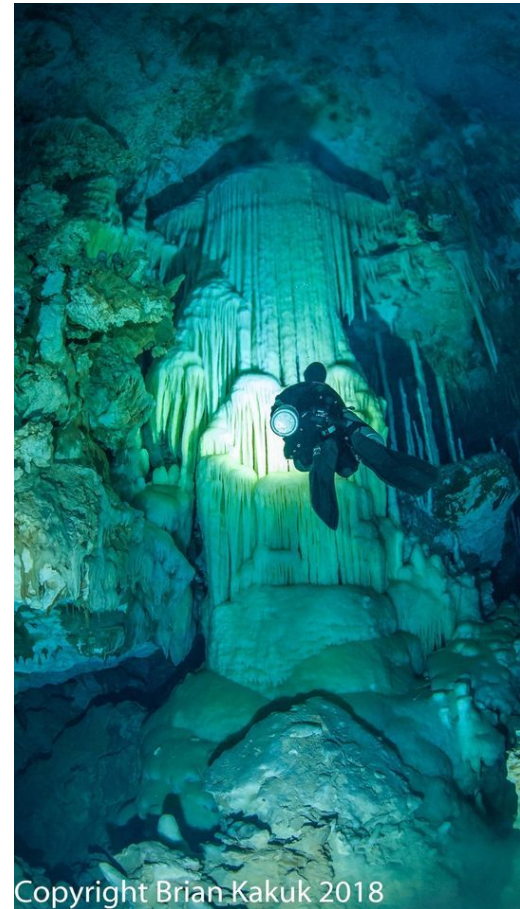
Other things also get trapped at the water table.... And the bathtub rings can even be a natural cement....

Brian Kakuk's image shows a thin and dramatic black line.... I would love to see if there is charcoal cemented in that bathtub ring. Cave sediments include quite surprising amounts of natural charcoal - washed into the cave and floating on the water table every time there is a forest fire. The Yucatan (and Bahamas) naturally have fires, and some of that forest fire charcoal gets cemented into the bathtub rings, while some of it ends up in the sediments on the floor when it very eventually sinks.

Other things that float on the water table can also get 'deposited' at the water table level - and can be surrounded by and even over-coated by the speleothem ring calcite.



In the case of Hoyo Negro - the decomposing bodies of late Pleistocene mega fauna left bones scattered all over, but including along the walls. By analysing where the highest bone was for a given individual - it is then possible to figure out the water table level when the body was floating there. Some of the bones fall down the wall over time due to gravity.... But really the most important piece is finding the HIGHEST bone for that individual.



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However - the bones give approximate water level, and that gives approximate date *maybe* for this last glacial cycle.... Or *maybe* the one before.... Or even one of the several before that. Not good enough!

One of my projects with INAH currently underway aims to analyze the bathtub rings to get ABSOLUTE date +/-~100 years on each of the rings all the way up and down Hoyo Negro, but also The Pit... and maybe some other sites with good rings that this discussion has shown! Even with very tiny samples, the uranium and thorium concentrations of the speleothem ring calcite gives the most amazing absolute dates possible.

AND super bonus - is that the water table in the Yucatan Peninsula is nearly matching the sea level - each of the dates on a bathtub also gives a most precious paleo sea level elevation. And right now - we really scientifically need decent paleo sea level records for the Western Caribbean.



This is CSI Geology at its finest - Many many hours with macro photography and dental picks required, and followed by literally months of excruciating and expensive uranium-thorium dating.