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A 2 ka stalagmite record of hurricane activity from Belize, Central America

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Tropical cyclones (TC, hurricanes, typhoons) pose one of the largest natural hazards in the tropics, with extremely high human and economic losses. Available palaeotempestological data are often limited by chronological uncertainties and resolution.
A strictly U/Th dated stalagmite δ18O record from Belize covers the past ca. 2.000 years at (sub-)annual resolution. Stalagmite YOK-I was collected in 2006 from Yok Balum Cave, S Belize, and subsequently sampled at 0.1 mm resolution. More than 30 U/Th dates, with an average error of ca. 10 years, and ca. 3200 stable isotope samples were obtained. The δ18O values range from -6 to -2.5 permil, with pronounced variation on annual to decadal scale. Spectral analysis reveals a strong 1.5-4 year frequency, pointing to some influence from the Pacific ENSO system. Distinct negative excursions are interpreted as reflecting increased hurricane activity, corroborated by drip water isotope monitoring and an earlier speleothem study from Belize.
Increased hurricane activity is recorded for the periods 530-730, 880-1050, 1120-1260, 1390-1420, and 1580-1840 AD. The later periods correlate with colder conditions in Europe (Little Ice Age). However, all periods show high variability in the δ18O record. The past ca. 170 years are characterized by reduced hurricane activity over Belize.
There is evidence that TC activity in Belize is tightly connected to atmospheric pattern in the N Atlantic and the Bermuda High. Colder conditions over the N Atlantic dislocate the Bermuda High southward. A strong and/or SW positioned Bermuda High shifts TC tracks southwestward, increasing the TC landfall frequency in Central America, while reducing it in Florida and the Atlantic coast of North America.
The results suggest warmer atmospheric conditions with a northward positioned Bermuda High and increased TC activity along the northern Gulf of Mexico (and reduced TC activity over Belize) during the last ca. 170 years. For the Late Classic Maya Period a drying trend is found, with several multi-year droughts. This climatic trend likely had severe consequences for the Maya civilization and may well have culminated in the collapse around 900 AD. However, societal factors certainly played a role in the decline of this great Central American culture.