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Past climate variability between 97 and 7 ka reconstructed from a multi proxy speleothem record from Western Cuba

Sophie Winterhalder (1,2,3), Denis Scholz (1), Augusto Mangini (2), Christoph Spötl (4), Klaus Peter Jochum (3), and Jesús M. Pajón (5)

(1) Institute for Geosciences, Johannes Gutenberg University, 55099 Mainz, Germany (sophie.winterhalder@uni-mainz.de), (2) Institute of Environmental Physics, Ruprecht Karls University, 69120 Heidelberg, Germany, (3) Max Planck Institute for Chemistry, 55128 Mainz, Germany, (4) Institute of Geology and Paleontology, University of Innsbruck, 6020 Innsbruck, Austria, (5) Dep. of Paleogeography and Paleobiology, National Museum of Natural History, La Habana, Cuba

The tropical hydrological cycle plays a key role in regulating global climate, mainly through the export of heat and moisture to higher latitudes, and is highly sensitive to climate change, for instance due to changes in the position of the Intertropical Convergence Zone (ITCZ). Previous work on Caribbean stalagmites suggests a strong connection of precipitation variability to North Atlantic (NA) sea surface temperatures on multidecadal to millenial timescales (Fensterer et al., 2012; Fensterer et al., 2013; Winter et al., 2011). Cold phases in the NA potentially lead to a southward shift of the ITCZ and thus drier conditions in Cuba. On orbital timescales, Cuban stalagmites suggest a relation of speleothem δ^{18}O values with the δ^{18}O value of Caribbean surface waters (Fensterer et al., 2013).

Here we present an expansion of the Cuban speleothem record covering the whole last glacial period from the end of MIS5c (97 ka BP) until 7 ka with hiatuses between 93-80 ka, 37-35 ka and 13-10 ka. Stalagmite Cuba medio (CM) has been precisely dated with 60 ^{230}Th/U-ages, mainly performed by the MC-ICPMS technique. The δ^{18}O and δ^{13}C records are completed by a continuous, high resolution LA-ICPMS trace element profile. These data allow for the first time to establish a multi-proxy climate reconstruction for the North Western Caribbean at decadal to centennial resolution for this period.

The long-term variability of the δ^{18}O values probably reflects rainfall amount in Cuba. The response to some Dansgaard/Oeschger and Heinrich stadials confirms the previously observed correlation between Caribbean and NA climate variability. However, this connection is not clearly imprinted throughout the record. Furthermore, trace elements, such as Mg, do not proof without ambiguity drier conditions in Cuba during NA cold events, such as the Heinrich stadials. This suggests that climate variability in Cuba was more complex during the last 100ka, and that the NA was not the only driving factor. Due to the competing influence of the NA, the Gulf of Mexico and the Pacific Ocean, the proposed severe changes in the tropical hydrological cycle during that time (such as variations of the ITCZ, insolation and the thermohaline circulation (THC)) have potentially lead to significant changes in sources and trajectories of precipitation in Western Cuba. Our record, thus, provides an important contribution towards understanding and differentiating these parameters on Caribbean climate during glacial climate changes.

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