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Holocene climate variability in the tropics - high resolution records from the Anegada-Jungfern Passage, NE-Caribbean

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The Caribbean region plays a crucial role for global oceanic circulation and climate due to its status as the main source area for the Gulf Stream, its proximity to the Intertropical Convergence Zone (ITCZ) and its central location for Atlantic hurricane passages. A key site is the Anegada-Jungfern Passage in the NE-Caribbean, located between St. Thomas and St. Croix. The passage is a deep gateway for water mass exchange between the North Atlantic and the Caribbean Sea and is characterized by the presence of well-stratified water masses, including Subtropical Surface Water, Antarctic Intermediate Water (AAIW), Atlantic Intermediate Water and North Atlantic Deep Water (NADW).

In 2007 a series of marine sediment cores were collected from the Anegada-Jungfern Passage during the Danish Galathea 3 Expedition (Leg 16: 'WINMARGIN' project). The longer cores encompass the period of the last ca. 40,000 years, while shorter cores give the possibility of high-resolution studies of the late Holocene. These and other cores have been used to track tropical ocean and climate variability and inter-hemispheric heat exchange for the last 40,000 years as well as to study the linkage and heat exchange between the tropical and polar regions. We have reconstructed water mass exchange through the Anegada-Jungfern Passage during the Holocene based on analyses of foraminiferal assemblages. Reconstruction of surface water conditions are based on planktonic foraminifera and stable isotopes, while information on intermediate and deep-water flow is based on benthic foraminifera. Geochemical and sedimentological analyses were achieved.

Our data show that during the glacial period, millennial-scale variability in sea-surface temperature and productivity related to Dansgaard-Oeschger oscillations characterised the area, showing that it was subject to significant oceanographic changes linked to these events. High-resolution records of the last 10,000 and 5,000 years show that the region was subject to oceanographic and atmospheric variability during the late Holocene. During the last 500 years tropical fauna seems to decrease whereas subtropical fauna slightly increases. These changes could be related to changes in water mass inflow into the Caribbean Sea which is supposed to be influenced by a changing atmospheric circulation over the North Atlantic (NAO).