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Synchroneity of Meltwater Pulse 1A and the Bolling onset: New evidence from the IODP "Tahiti Sea-Level" Expedition

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So far, the most complete and accurate sea-level record that encompassed the period between the Last Glacial Maximum and the present day is based on cores drilled offshore the Barbados coral reef [1,2]. This record suggests a non-monotonous sea-level rise punctuated by dramatic accelerations, the so-called Melt Water Pulse events, that correspond to massive inputs of continental ice. The most extreme of these events, the so-called MWP1-A, initially identified in the coral-based sea level record from the Barbados island, suggests a sea-level rise of ∼20 meters between 14.1 and 13.6 ka [3,4].
However, this event remains enigmatic and controversial. Barbados Island is relatively close to the former North-American ice sheet and the island itself belongs to an accretionary prism overlying an active subduction zone. The possibility remains that the apparent sea-level record may be flawed by tectonic or isostatic complications. Several records are consistent with its occurrence [5,6], but no broad agreement emerges about its timing and amplitude. Because of this lack of consensus, the temporal relationship between the MWP1-A and the abrupt, millennial-timescale, climatic events that punctuated the last deglaciation is a subject of controversial debates [7,8]. Furthermore, the ice source responsible for such a step in sea-level rise is still elusive [9,10].
Consequently, it remains a key issue to fully confirm the existence and amplitude of the MWP-1A by a precise coral reef record in a far-field site located in a oceanic basin distant from Barbados. The recent IODP Expedition 310 "Tahiti Sea Level" offers a unique opportunity to extend the existing Tahiti sea-level curve that documents the deglacial sea level rise for the last 13.8 ka [5]. Located at a considerable distance from the major former ice sheets and characterized by slow and regular subsidence rates, the Tahiti coral reefs provide an ideal setting to constrain MWP events that are thought to have punctuated the last deglaciation. The offshore coring operations carried out during Expedition 310 recovered more than 400 m of post-glacial reef material, ranging from 122 to 40 m below modern sea level [11].
Post-glacial coral material was selected using strict mineralogical and isotopic screening criteria in order to preclude any post-mortem diagenetic alteration of the coral skeleton. More than 60 U-Th ages were obtained on various types of corals characterizing shallow to deeper environments that extend the previous Tahiti record to 16 ka and allow to document the sea-level rise during the key period of the MWP-1A. Our results confirm the occurrence of an acceleration of the sea-level rise during that period. However, the timing and duration of this event differ significantly from observations from Barbados [3,4]. These new results indicate that the MWP-1A occurred at about 14.6 ka BP, synchronously with the Bølling onset. This allows us to revisit the relationship between the MWP-1A and the climate history of the last deglaciation. Their implications in terms of the potential sources of the ice that generated the MWP-1A will be also discussed.

[1] Fairbanks, 1989, Nature 342, 637.
[2] Bard et al., 1990, Nature 346, 456.
[3] Fairbanks et al., 2005, Quaternary Science Reviews 24, 1781.
[4] Peltier and Fairbanks, 2006, Quaternary Science Reviews 25, 3322.
[5] Bard et al., 1996, Nature 382, 241.
[6] Hanebuth et al., 2000, Science 288, 1033-1035.

[7] Weaver et al., 2003, Science 299, 1709-1713.
[8] Stanford et al., 2006, Paleoceanography 21.
[9] Clark et al., 1996, Paleoceanography 11, 563-577.
[10] Clark et al.; 2002. Science 295, 2438-2441.
[11] Camoin et al., 2007, Proc. IODP, 310