Geophysical Research Abstracts
Vol. 16, EGU2014-662, 2014
EGU General Assembly 2014

Ocean-Atmosphere climate shift during the Mid-to-Late Holocene transition

Audrey Morley (1), Yair Rosenthal (2), and Peter deMenocal (3)

(1) School of Geography and Archaeology, National University of Ireland, Galway, Ireland (audrey.morley@nuigalway.ie), (2) Institute of Marine and Coastal Sciences and Department of Geology, Rutgers, The State University of New Jersey, New Brunswick, USA (rosentha@marine.rutgers.edu), (3) Earth and Environmental Sciences Lamont-Doherty Earth Observatory, Columbia University, Earth Institute, Palisades, USA (peter@ldeo.columbia.edu)

Here we present North Atlantic Central Water circulation as a possible mechanism regulating the latitudinal temperature gradient (LTG), which, in turn, amplifies climate sensitivity to small changes in solar irradiance during the Holocene. Through this mechanism, sharp climate events and transitions are the result of a positive feedback process that propagates and amplifies climate events in the North Atlantic region. We explore these linkages using an intermediate water temperature record reconstructed from Mg/Ca measurements of benthic foraminifera (Hyalinea balthica) from a sediment core off NW Africa (889m depth) over the mid-to-late Holocene transition (0-5.5 ka). Our results show that Eastern North Atlantic Central Waters (ENACW) cooled by $\sim 1^{\circ} \pm 0.7$C and densities decreased by $\sigma\theta = 0.4 \pm 0.2$ between 3.3 and 2.6 ka. This shift in ENACW hydrography illustrates a transition towards enhanced mid-latitude atmospheric circulation after 2.7 ka in particular during cold events of the late-Holocene. The presented records demonstrate the important role of ENACW circulation in propagating the climate signatures of the LTG by reducing the meridional heat transfer from high to low latitudes. This response is a prime example of an amplifying feedback mechanism within the climate system and its identification will help to advance our understanding of how regional climate change is transferred and amplified to affect hemispheric wide climate linkages.