Geophysical Research Abstracts
Vol. 14, EGU2012-7706, 2012
EGU General Assembly 2012

Have abrupt climate variations of the last glacial possibly been muted in the south-west African tropics by counteracting mechanisms?

I. Hessler, L. Dupont, D. Handiani, S. Steinke, J. Groeneveld, U. Merkel, and A. Paul
MARUM-Center for Marine Environmental Sciences, Germany (ihessler@marum.de)

The last glacial period including the last deglaciation (73.5-10 ka BP) is characterised by abrupt shifts between extreme climatic conditions. Millennial-scale climate variations associated with North Atlantic Heinrich Stadials (HSs) are thought to be transmitted by both the atmospheric and oceanic circulation resulting in a near-global footprint. It is further thought that HSs are closely related to a reduction or shut-down of the Atlantic Meridional Overturning Circulation, which, according to the bipolar-seesaw hypothesis, leads to the accumulation of heat in the South Atlantic. In addition, it is hypothesised that HSs result in a southward shift of the Intertropical Convergence Zone which then would likely influence the vegetation composition in the African tropics.

To investigate the impact of HSs on the terrestrial African realm and the south-east Atlantic we reconstructed the vegetation development in Angola and the southern Congo Basin as well as the sea surface temperatures (SST) of the south-east Atlantic using marine sediments of ODP Site 1078 (11°55'S, 13°24'E, 427 m water depth).

Two species of planktonic foraminifera were selected to reconstruct variations in surface water conditions in the south-east Atlantic. Due the ecological and seasonal preferences of *Globigerinoides ruber* (pink) this species provides a good tool to estimate SST variations during the southern hemisphere summer. In contrast, *Globigerina bulloides* is representing the Benguela Upwelling System during the southern hemisphere winter. While Mg/Ca-based SSTs of *G. ruber* (pink) were significantly higher by 1°-2°C during periods of abrupt climate change, the impact of HSs during southern hemisphere winter is less obvious.

However, although there are several vegetation records that show an impact of HSs in the African tropics, our high-resolution pollen record from ODP Site 1078 reflects no vegetation changes during periods of HSs. Model simulations conducted with an Earth System Model of Intermediate Complexity (EMIC) provide one plausible explanation for the absence of HSs in our vegetation record. Although both precipitation and evaporation are higher during HSs, their contrasting nature leads to a net-freshwater flux of about zero. Consequently, the resulting climatic response to HS might have been simply to weak in south-west Africa to affect the vegetation composition in a distinct way. The reliability of the EMIC simulations is supported by experiments conducted with the Community Climate System Model Version 3 (CCSM3) which is including a comprehensive atmospheric and land model component.