surface ocean solas lower atmosphere study

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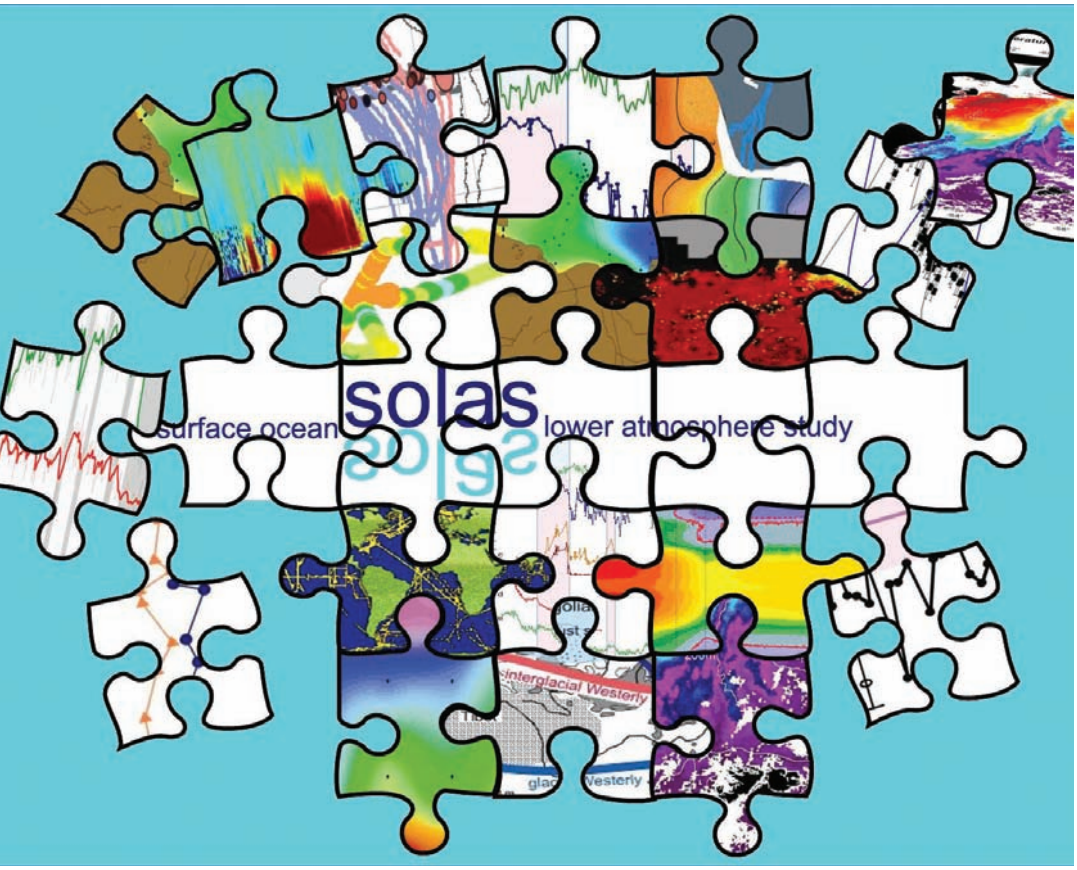


SOLAS Collaborations

This issue of SOLAS news focuses on the wider perspective of SOLAS science: science overlapping with other projects, studies and institutions. Encouraging cross-network collaborations and expanding research connections is of the upmost importance to SOLAS and we see it as a prerequisite to, collectively, gain further understanding of the Earth system.

We have brought to you an impressive selection of scientists from across the world specialising in a multitude of fields and interests. Issue 9 even boasts a section on Palaeoclimatology from PAGES's associated scientists, see the 'Palaeo-SOLAS' section.

Additionally, this year has been eventful for COST Action 735 and the work will be introduced to you in this issue, along with the most recent update on SOLAS Data Integration activities.

Having thoroughly enjoyed collating this stand-alone issue, introducing the work of some of our partner projects, we hope that it will initiate the exchange of further communication and alliance between our research companions.

Important deadlines for the SOLAS Open Science Conference are swiftly approaching; and alert you of the opportunity to host a discussion session during the conference. Application for proposals closes on 31st July and further information on how to apply; submitting a poster abstract and all additional information about the event can be found at: http://www.solas2009.confmanager.com/

In the meantime, we wish you a relaxing summer holiday and happy reading, as we head to Corsica for our 4th SOLAS Summer School.

Georgia Bayliss-Brown, SOLAS Project Officer

in this issue...

Scientific Contributions

Plus 13 more

SOLAS endorsed projects

plus...

including...

6 Partner projects

4 National reports

Syee Weldeab is currently at the Leibniz Institute for Marine Science (IFM-GEOMAR) in Kiel, Germany. On July, he will assume a tenure track position at the Department of Earth Science, University of California at Santa Barbara, USA. His research works focus on the reconstruction of past African monsoon variability and its linkage to tropical ocean sea surface temperatures and high latitude climates.

Monsoon response to global climate changes: a clue from the past

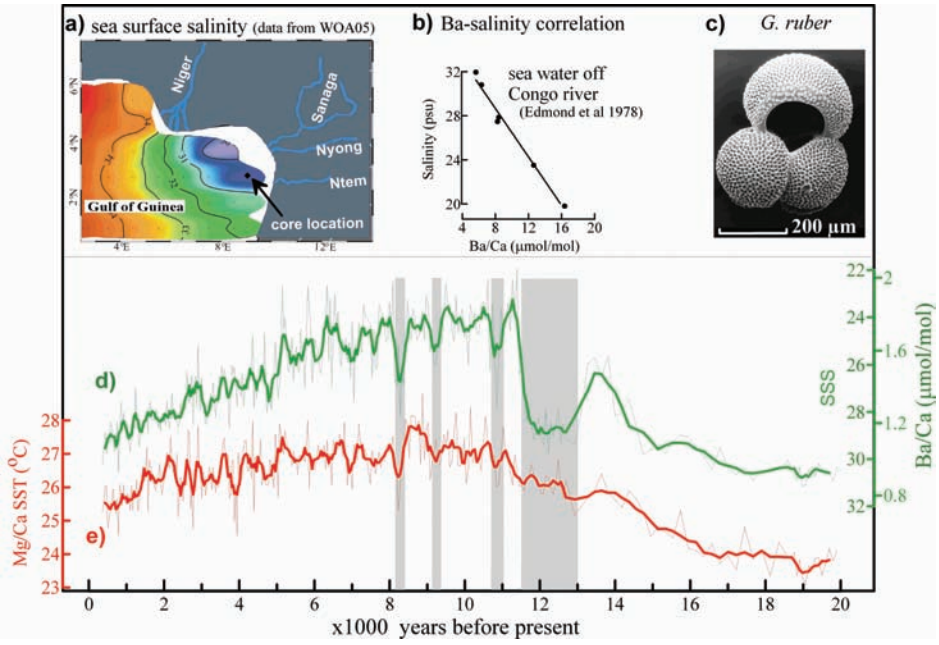
Syee Weldeab, IFM-GEOMAR, Kiel, Germany Contact: sweldeab@ifm-geomar.de

The livelihood of the largest part of the world's population depends on monsoon rainfall. Because of its societal importance, internationally concerted efforts such as the "African Monsoon Multidisciplinary Analysis" attempt to better understand regional variability with the aim to provide robust monsoon predictions. In order to understand monsoon responses under different boundary conditions, insights from past monsoon rainfall variability may provide crucial constraints.

Here I report a record of past West African monsoon rainfall variability from a sediment core drilled from the Gulf of Guinea. Mg/Ca and Ba/Ca measured from calcite shell of mixed layer-dwelling planktonic foraminifers (*Globigerinoides ruber*) provide insights into past eastern equatorial Atlantic SST and changes in discharge of Niger and Sanaga-Nyon-Ntem Rivers that drain large part of West Africa monsoon area [*Weldeab, et al.*, 2007a; *Weldeab, et al.*, 2007b]. The incorporation of Mg in foraminiferal calcite shell is thermodynamically controlled and thus the Mg/Ca provide a quantitative seawater temperature estimate at which the foraminifer calcified [*Nürnberg, et al.*, 1996]. Dissolved Ba is enriched in riverine water relative to seawater [*Edmond, et al.*, 1978], and thus near-river mouth Ba concentration in sea water reflects changes in runoff. Because the uptake of Ba in foraminiferal calcite co-varies linearly with changes in Ba concentration of sea water [*Lea and Spero*, 1994], I used the former to track past changes in riverine discharges [*Weldeab, et al.*, 2007a; *Weldeab, et al.*, 2007b].

Estimates of Mg/Ca-based SST and Ba/Ca-based riverine discharge over the last 20,000 years are shown in Figure-1. The most outstanding feature is that when super-imposed over the long-term trends, the Ba/Ca record is punctuated by several sharp centennial-scale minima. These prominent drops in Ba/Ca occurred at 12,900-11,600, 11,000–10,780, 9,450–9,150, and 8,430–8,140 years before present (BP), suggesting an abrupt decline of riverine runoff and precipitation over the monsoon-affected areas at these times. Another striking feature of these data is the rapidity with which the changes occurred. For instance, the highest riverine discharge of the early and middle Holocene declined within ~20 years to a level close to that of the late Holocene.

The role of the eastern equatorial Atlantic SST, as indicated by the Mg/Ca record, in shaping the monsoon precipitation is difficult to assess. For instance, the most severe deterioration in West Africa climate during the Younger Dryas (12,900-11,600 years BP) is not accompanied by changes in eastern equatorial SST estimates, suggesting the SST did not exert a primary control over the West Africa precipitation at that time. In contrast, all intervals with significant drops in monsoon precipitation, as suggested in the Ba/Ca record, correlate well to or overlap with the timing of cooling over Greenland [*NGRIP-members*, 2004]; fresh water fluxes into the North Atlantic; and perturbation of the Atlantic meridional thermohaline circulation (THC) [*Clark, et al.*, 2001]. It is thus suggested that fresh water-induced perturbation of the THC had a strong control on the West Africa monsoon rainfall variability, most likely by modulating the extent of northward migration of the intertropical convergence zone.



Λ Figure 1: Results of Mg/Ca-based SST estimates (e) and Ba/Ca (d) analyses performed in G. ruber test (c) from a core retrieved from the Gulf of Guinea (a). Semi-qualitative Ba/Ca-based sea surface salinity (SSS) estimate (d) based on modern Baseawater-salinity relationship off the Congo River (b) and partition coefficient for Ba incorporation in foraminifera calcite.

References

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