

Contributions from the paleosciences
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PAGES
Past Global Changes

www.pages-igbp.org

*An IGBP core project co-funded by Swiss and US National Science Foundations,
& US National Oceanic and Atmospheric Administration*

GLOBAL IGBP CHANGE

International Council for Science
Scientific Committee on Oceanic Research

IGBP-SCOR Fast Track Initiative (FTI) "Ocean Acidification"

**First IGBP–SCOR FTI Workshop:
“Ocean Acidification - modern observations
and past experiences”**

Lamont-Doherty Earth Observatory of Columbia University
September 28 – 30, 2006

**What can we learn from past changes in the Earth system to
better understand the consequences of ongoing ocean acidification?**

IGBP–SCOR Fast-Track Initiative “Ocean Acidification”

- inspiring dialogue between “present” and “past” scientists
- ocean carbonate chemistry -- reasonably well known and predictable
- organismal response -- poorly known
- evolutionary capability -- completely unknown

- enthusiasm for communication and outreach on the OA topic



Follow-ups with paleo-components

- ESF workshop (PAGES co-sponsored), Barcelona/San Feliu, 26-28 Sep 07
Atmospheric CO₂, ocean acidification, and ecological changes in planktonic calcifying organisms
- Geologische Vereinigung meeting session, Bremen, Oct 07
- Oceans in a high-CO₂ world symposium, Monaco, 2008

- EurOpA proposal



Why paleo?

"The farther backward you can look, the farther forward you are likely to see." Winston Churchill

- What has happened *can* happen (e.g. perturbation of ocean chemistry)
- Long-term (natural) context for recent changes (e.g. OA "hockey stick")
- Analogies to aspects of present/future OA (although no perfect analogue)
- Different scenarios as case and sensitivity studies and testbeds for models

Why paleo?

Real world

- comprise the actual complexity of the chemical, biological and ecological systems and interactions between them

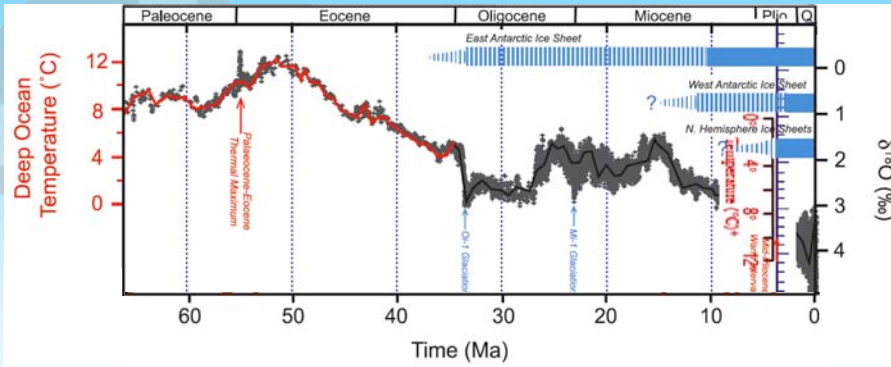
Real time

- capture the time component inherent to some processes such as ecological adaptation, evolution, carbonate buffering, recovery processes

Limitations

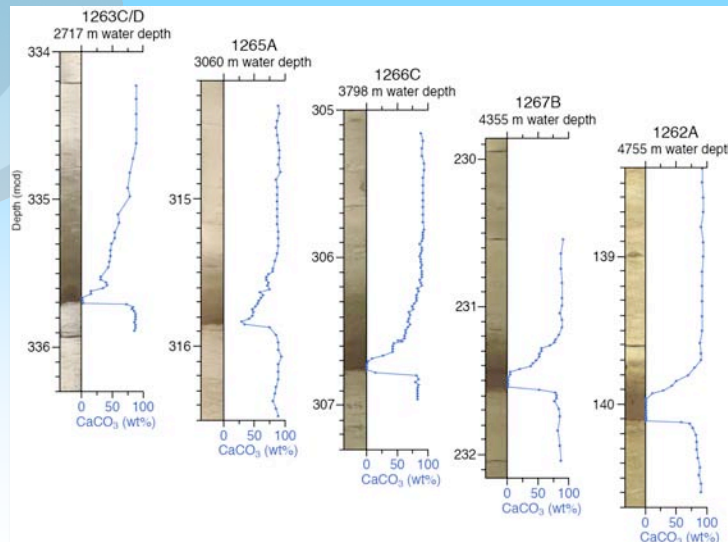
- difficulty to capture processes
- accuracy of proxy reconstructions
- restrictions on temporal and spatial resolution
- [no perfect analogue scenarios]

Paleocene-Eocene Thermal Maximum 55 Myr ago

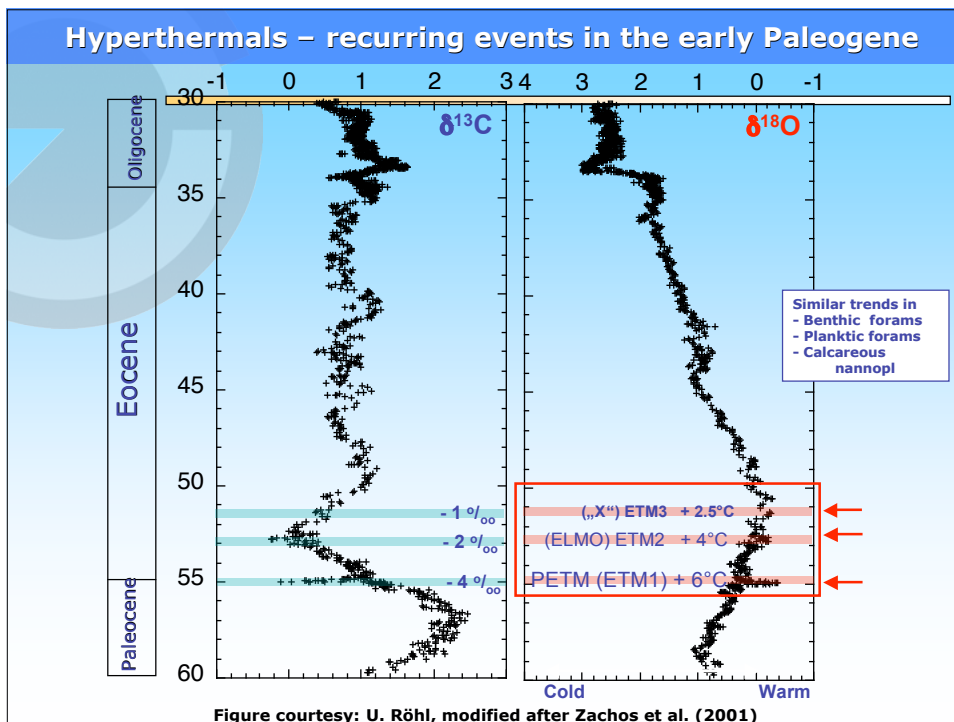
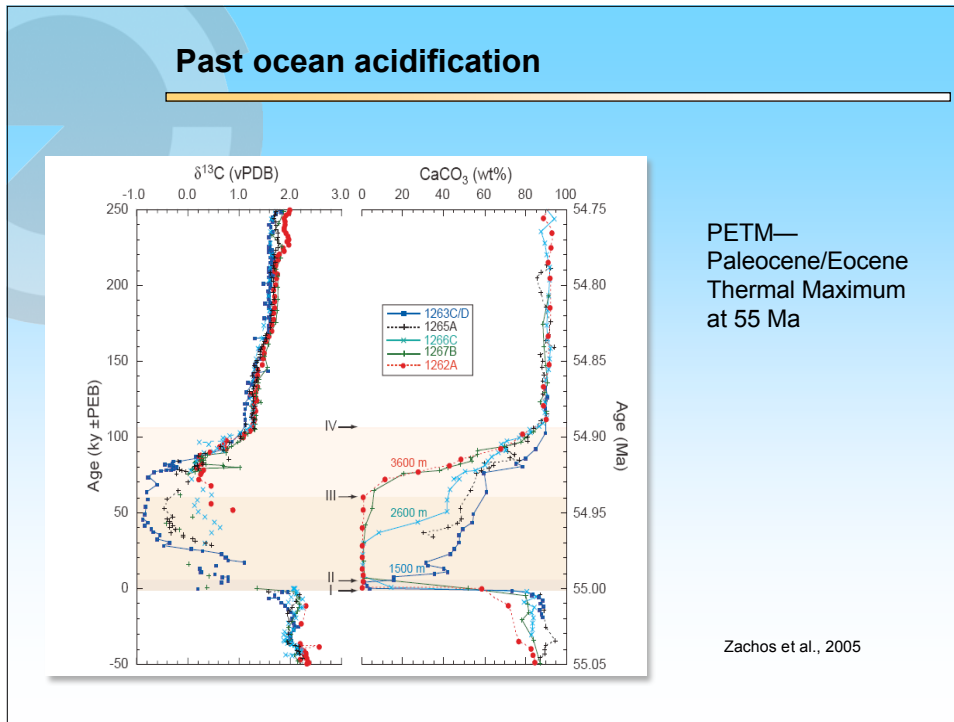


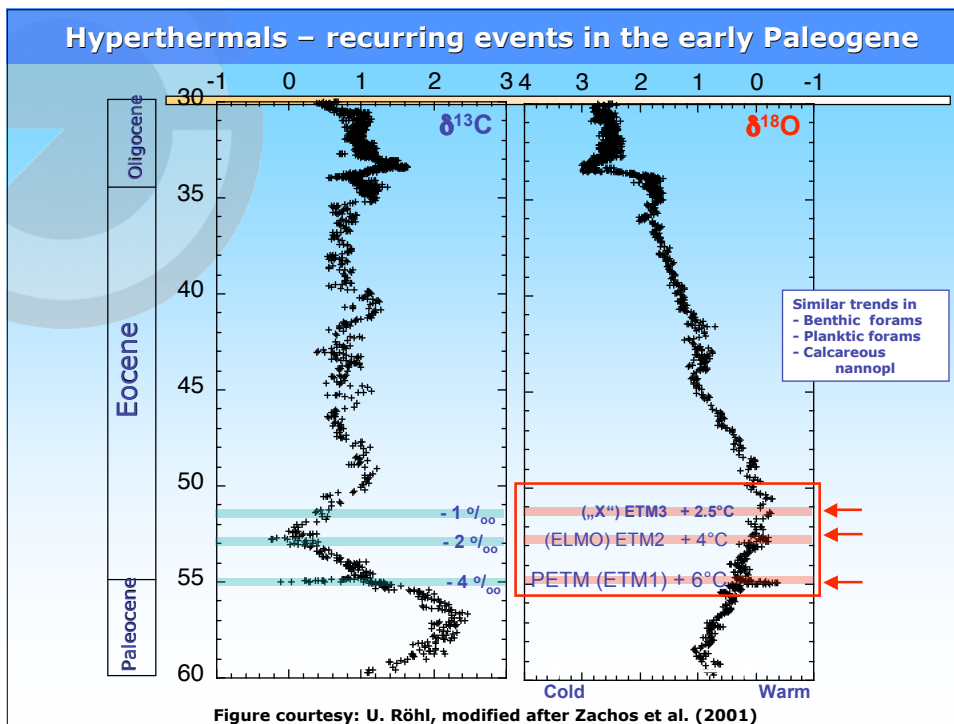
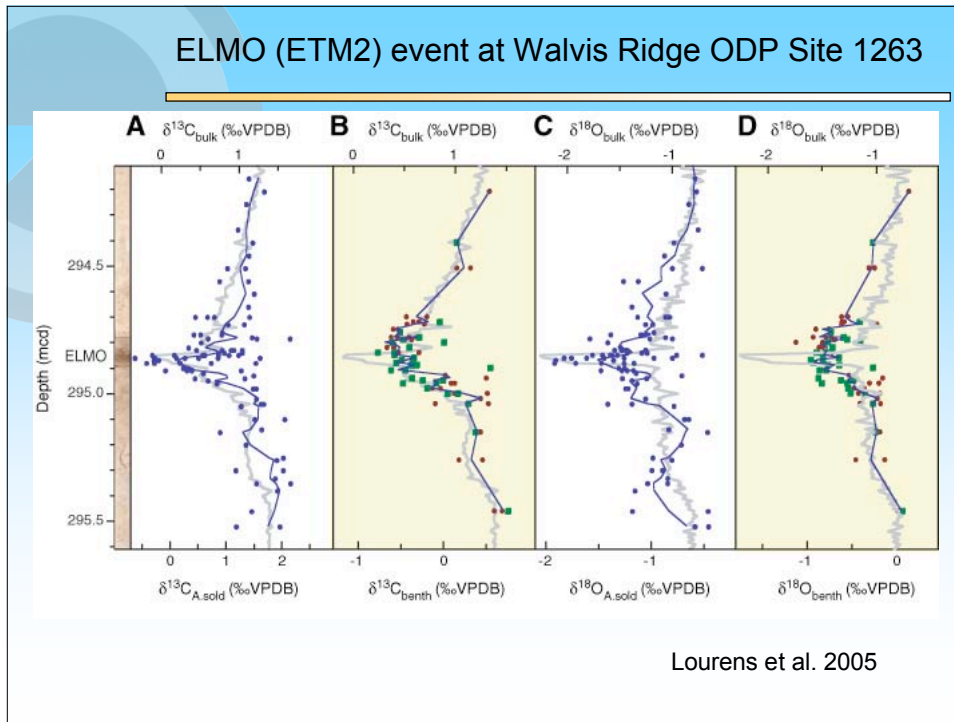
Zachos et al. (2001)

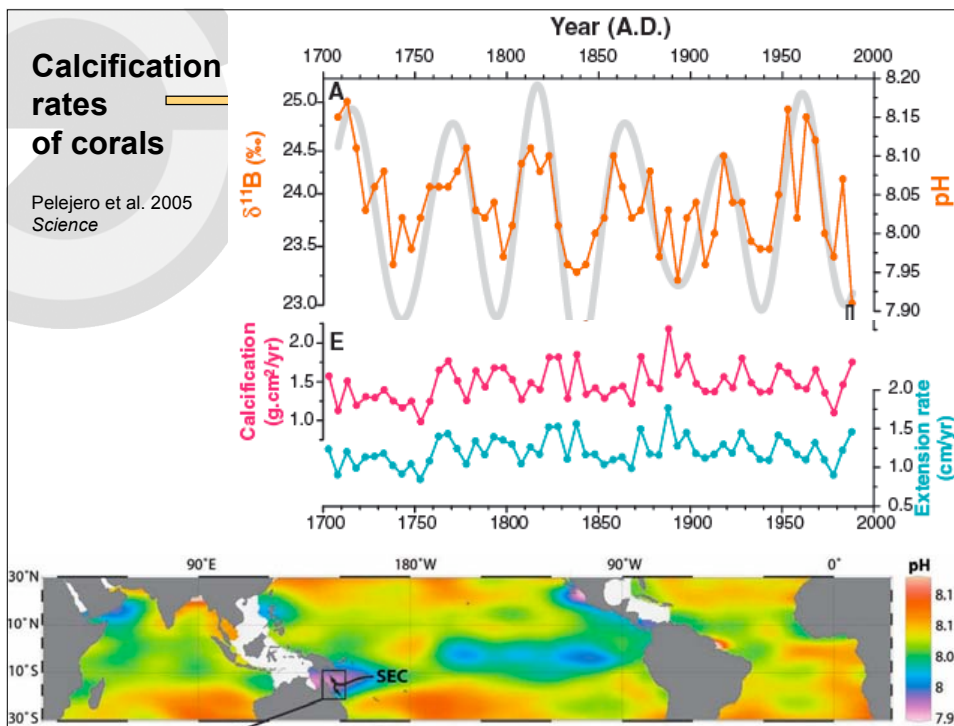
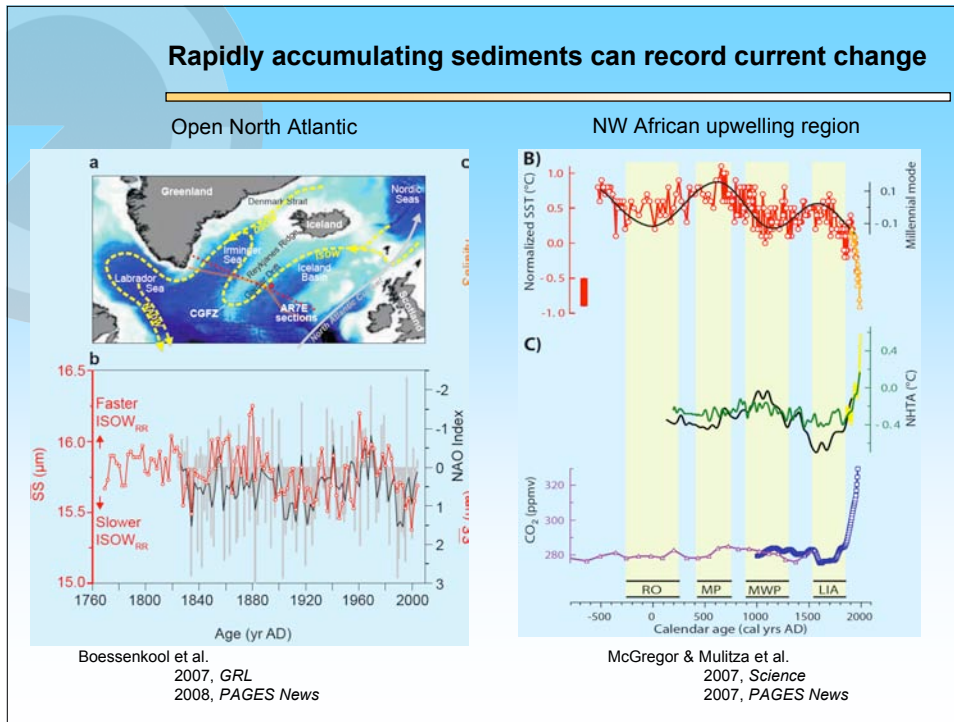
Paleocene-Eocene Thermal Maximum 55 Myr ago:



Zachos et al. (2005)

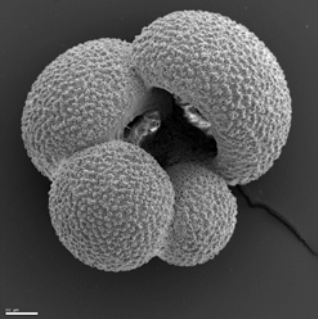


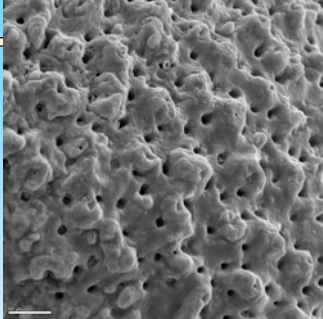




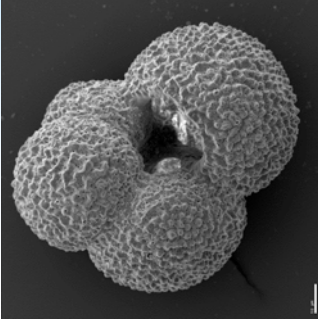
Calcification of foraminifera

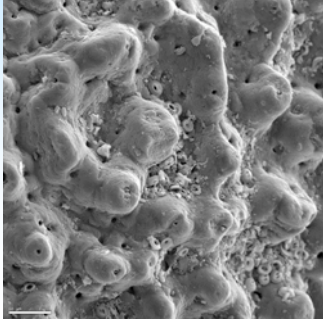
Interglacial
280 ppm CO₂
pH ≈ 8.15

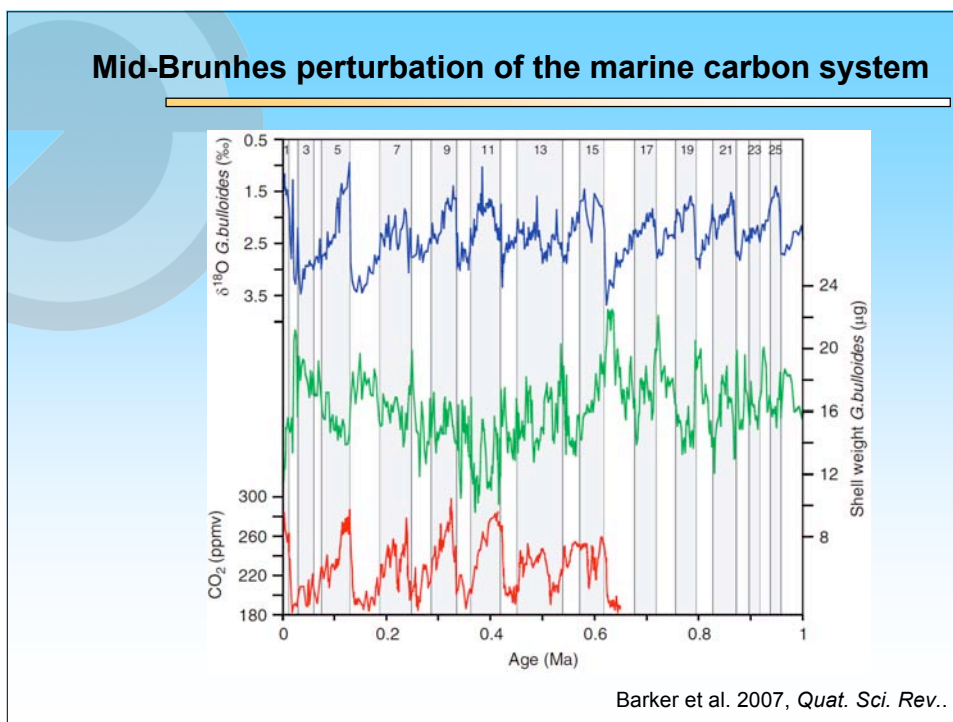




Glacial
200 ppm CO₂
pH ≈ 8.3







OA in PAGES

SSC identified OA as the prime marine topic (to go into new Science Plan)

Setting up of a paleo-OA task group within PAGES
(complementary to ongoing interaction across past-present-future timescales)

- Synthesis of results
- Visibility of the science and its potential
- Coordination of activities
- Contact for wider OA community

3rd PAGES Open Science Meeting
8-11 July 2009 - Corvallis, Oregon, USA

Conclusion

Paleoscience can contribute to specific important questions on future OA

It should therefore be part of integrated research