the analytical uncertainty when several individual pieces of the same coral are measured, thus age replication is crucial to establish the level of age uncertainty associated with sample heterogeneity; 2) The stratigraphic context of corals provides a key constraint on relative ages that has been largely underutilized. Publications should include this information, rather than just sample elevations; 3) Both sample screening and age correction approaches rely heavily on the $^{234}U/^{238}U$ ratio of seawater; yet the history of ocean uranium isotopic composition is not well known. Furthermore, $^{234}U/^{238}U$ values for screening and correction are not consistent between different lab groups. It is important to adopt a uniform history of ocean $^{234}U/^{238}U$ for quality and correction criteria, and to incorporate seawater $^{234}U/^{238}U$ uncertainty into error estimates for the ages.

Compilation

A key goal of PALSEA is to establish a comprehensive Quaternary sea level database. This data is presently scattered across the scientific literature with widely varying reporting formats, screening and correction criteria, and decay constants. Stratigraphic information is often incomplete, and elevations are not tied to consistent benchmarks. It is highly desirable to compile existing data in a uniform format that can be made available to the wider community, and to adopt a uniform set of standards for future data reporting. Thus PALSEA is currently compiling existing data, which will be available on the PALSEA website. Data management software, that processes raw ICP-MS data, produces publication quality data tables, and links seamlessly with the EarthChem database developed through the EARTHTIME project, and discussions are underway to adapt this software for the U-Th chronometer.

Ice sheet recommendations

Relative sea level histories permit the reconstruction of former ice sheets—a fundamental boundary condition for modeling past climate. PALSEA suggests the following ice sheet guidelines for the Paleoclimate Modeling Intercomparison Project (PMIP): 1) Alternative ice sheet boundary conditions, generated by independent glacial isostatic adjustment (GIA) models must be considered. 2) An existing database (Dyke et al., 2002) that uses evidence of ice-sheet extent should be used. 3) GIA models use different relative sea level databases, many with inconsistent or outdated reconstructions. To address this problem PALSEA aims to develop an open-access, quality-controlled database of relative sea level using consistent age estimates for use in isostatic models. This will allow improvements in isostatic models in the future, which should be incorporated into PMIP simulations.

Public outreach

The meeting included a public outreach event: "Where land and sea meet: Managing shoreline change over the next 100 years", funded by the Woods Hole Oceanographic Institution Morss Colloquium. This event brought together PALSEA scientists with economic, legal, and policy experts for a series of brief presentations and a panel discussion responding to audience questions.

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References

Andersen, M.B., Stirling, C.H., Potter, E.-K., Halliday, A.N., Blake, S.G., McCulloch, M.T., Ayling, B.F. and O'Leary, M., 2008: High-precision U-series measurements of more than 500,000 year old fossil corals, *Earth and Planetary Science Letters*, **265**: 229-245.

Dyke, A.S., Andrews, J.T., Clark, P.U., England, J.H., Miller, G.H., Shaw, J. and Veillette, J., 2002: The Laurentide and Innuitian ice sheets during the Last Glacial Maximum, *Quaternary Science Reviews*, **21**: 9-32.

Gallup, C.D., Edwards, R.L. and Johnson, R.G., 1994: The timing of high sea levels over the past 200,000 years, *Science*, **263**: 796-800.

Thompson, W.G., Spiegelman, M.W., Goldstein, S.L. and Speed, R.C., 2003: An Open-System model for the U-series age determinations of fossil corals, *Earth and Planetary Science Letters*, **210**: 365-381.

High- to mid-latitude northern atmospheric circulation changes during the last climate cycle

ADOM

1st ADOM Workshop, Hyères-les-Palmiers, France, 1- 4 November 2009

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How dusty was the world during the last climate cycle? Modeling efforts are performed focusing specifically on the role of dust in driving past climate changes. At the first workshop of the PAGES Working Group "Atmospheric circulation Dynamics during the last glacial cycle: Observations and Modeling" (ADOM), presentations were given on paleodust records from ice core, terrestrial and marine eolian archives, on process studies of dust emission and transport, and on modeling dust as an environmental agent.

When summarizing the presentations of this meeting, a question immediately comes to mind: How can loess sequences be related to dust records from ice cores? Due to the importance of small-scale transport and deposition processes of dust, loess sequences are difficult for modelers to apprehend. Loess series can provide information on dust sources because a close connection can be established between deposit and source(s). On the other hand, in ice cores one only observes the result of long distance transport, making attribution to a specific source area more difficult. Up to now, there is no precise information on the geological characteristics for precisely identifying key source regions. What are the meteorological and geological features that control dust emission processes in the different source locations (Fig. 1)? What are the properties of the emitted dust particles? How is dust transported from its source localities? These questions are as yet unsolved. However, due to their ability to record long-distance dust transport, ice cores may help clarify these issues, all of which address the critical questions of the origin of dust and the processes involved in dust emission and transport towards the deposition location.

How dust affects the climate is another key question that was raised during the meeting. Observational data provide information on actual deposition, while models, which address the radiative forc-

ing effect of dust on the climate, estimate the probable dust concentration in the atmosphere from which deposition fluxes are calculated, generally using simplified parameterizations.

In contrast to greenhouse gases, it is unclear how globally representative the ice core record of dust is. Debating this issue, the participants raised two problems: i) Which grain size range should we investigate, as most records correspond to large dust particles? ii) If small size particles are being investigated, washout of the atmospheric dust load must be addressed through consideration of precipitation parameters along the dust transport pathway. This information is only available from models.

Another question was raised following the presentations related to the Chinese sequences. Contrary to European loess, they do not record Dansgaard-Oeschger-like events, yet reveal events apparently synchronous to the North Atlantic Heinrich events. What are the changes in the climatic zones driving millennial-scale variations in dust deposition? The time resolution of the records is particularly critical as highlighted during the meeting and must be improved, as it will impact the global versus regional comparisons.

As the different presentations referred to different time intervals, the participants discussed whether one or more whole glacial intervals should be considered, or whether one should focus only on particular events/intervals. Addressing these questions led to the following questions: What dust was really present in the atmosphere in terms of the size of the particles and quantities? Are the modern atmospheric processes compatible with the strong dust loading of the past?

Concerning the source areas, questions remain on the potential for dust emission and initial mixing altitude (low and high elevation), as well as the frequency and strength of particular dust events. For example, to what altitude can dust grains be uplifted under different climate conditions? Concerning more specifically the Greenland record, is the transport of possible emitted dust material from China still a robust assumption? Indeed the transport pathway from China to Greenland is still questionable based on present-day models and geochemical analyses performed on dust particles. What is the history of air masses responsible for dust transport, and what role does seasonality play in the transport? Although it has been used to explain transport to Antarctica, the question also remains as to how useful radon is as a tracer of air mass transport. The second ADOM meeting, to be held early 2011 will aim to address some of these questions.

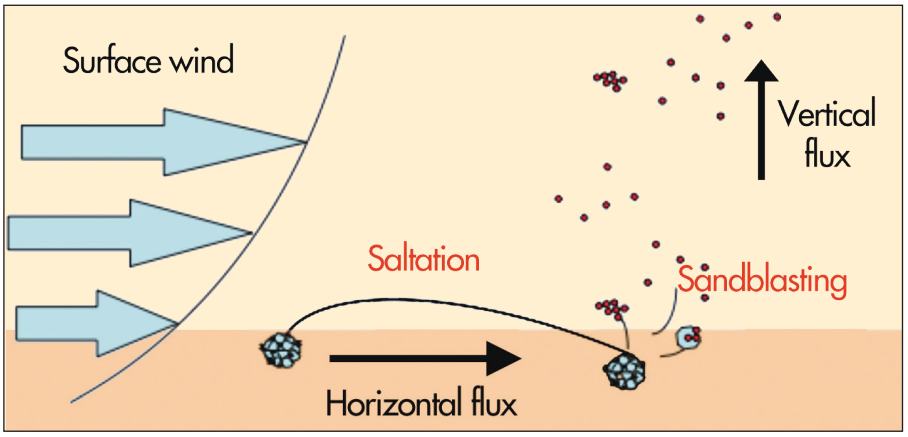

Figure 1: Schematic of the processes involved in dust emission. When wind velocity is of sufficient strength over a surface that is not totally protected by vegetation, stones or pebbles, the grains that constitute the superficial layer of the soil, begin to move. When these grains mobilized by wind (saltation) fall back to the land surface, a part of their kinetic energy is transferred to soil aggregates, which are disrupted, allowing finer particles (generally < 20 µm) to be emitted into the atmosphere (sandblasting) (modified from G. Bergametti, unpublished).

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The West African Quaternary Research Association inaugural international workshop

Ibadan, Nigeria, 26 – 30 October 2009

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The first West African Quaternary Research Association (WAQUA) international workshop aimed to enhance the growth of Quaternary paleoscience and generate interest among younger scientists in research works that focus on paleontology, archaeology, past environments and climate, coastal erosion and sea level changes in the West African subregion. The workshop also sought to promote regional collaborations and intensify scientific exchange. Sessions were held under the theme "The West African Quaternary Paleoclimatic/Sea Level Changes and Human Responses: Evidences from Marine and Terrestrial Sources" with the aim of understanding how information stored in geological archives can be used to reconstruct environmental/climatic variability of the past 2 Ma, for climate modeling and forecasting of the future. The workshop further focused on human adaptations to climatic variations and coastal erosion during the Late Quaternary. A general discussion was also organized to identify research priorities and form working groups to address paleoscientific issues covering the last 2 Ma.

Workshop sessions

The workshop was attended by over 50 participants from different countries in West, East and Southern Africa. The first day opened with keynote presentations and a plenary session. Two keynote presentations were given that discussed the importance of Africa's paleo-climatic archives covering the last approx. 2 ka in determining climate change and human impact in Africa.

The keynote address by Mohammed Umer highlighted how the fragmentation of West African rainforest and major water bodies during the Last Glacial Maximum were associated with a shift to a drier climate. However, the mechanisms driving those changes that occurred abruptly after 5.5-5 cal ka BP need further investigation, such as the relation between insolation forcing and ocean temperature-vegetation feedbacks. He also noted that 19–23 ka precession cycles could be a forcing element for the enhanced monsoons at 35-30 cal ka BP, the Early Holocene and for the dry LGM (e.g., see Umer et al., 2004).