PAGES
PAST GLOBAL CHANGES

A CORE PROJECT OF
THE INTERNATIONAL
GEOSPHERE-BIOSPHERE
PROGRAMME IGBP

News of the International Paleoscience Community
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GREETINGS FROM PAGES

It is a pleasure to report that the PAGES project is progressing well. A Core Project Office has been established in Bern, Switzerland; executive and scientific steering committees have been appointed; and an experienced and enthusiastic staff has been assembled. In the last year, PAGES has been associated with more than 15 different meetings and workshops dealing with all aspects of global change research. Having developed strong working relationships with a number of previously established and newly formed international research projects and initiatives, PAGES looks forward to a busy and productive future.

The fundamental reasons for the establishment of PAGES are more timely and pressing than ever. An improved understanding of past global change is crucial to our evaluation of present environmental conditions and of predictive climatic models for the future. Indeed, if public policy is to be based, at least in part, on risk assessments derived from global climatic models, we must have a detailed picture of how the Earth system has functioned in the past. It is essential to use the paleoclimatic record to identify the initial, pre-societal conditions of climate variability to distinguish natural variation from human-induced global change. Paleoclimatic and paleoenvironmental data also provide our clearest insight into ecosystem response to climate change at many different time scales.

Worldwide, global change research is expanding at a remarkable pace. Within the broad field of paleo-climatology, this pace is being driven by advances in the analytical and numerical methods used to obtain and analyze raw climate data, as well as the retrieval of longer and more detailed records covering broader geographical areas. Important influences outside the specific field of past global change include recent advances in combining climate and biosphere modelling outlined at the recent IGBP meeting in Ensenada, Mexico. As modelling efforts incorporate more of the complexities of the Earth system, there will be an urgent need for more detailed reconstructions of past climatic, biotic and environmental change for comparison with the type and scope of changes predicted for the future.

The immediate future, then, offers a vast array of challenges and opportunities for the international global change community. At PAGES, we hope to act as a conduit for information and cooperation stretching across scientific subdisciplines and national boundaries to improve our understanding of Earth system history. Through international workshops and cooperative research efforts such as those described in this newsletter, we are seeking, among other things, to increase the amount, quality and availability of basic paleoclimate data, to further both innovative and established approaches to climate reconstruction, and to use these reconstructions as tests of the predictive value of different climate modelling efforts.

In this newsletter, we detail some of PAGES goals and plans for the future and also present an overview of recent PAGES related activities. We strongly encourage input from the international paleoscience community concerning PAGES activities and initiatives through either the PAGES Scientific Steering Committee (SSC) or directly through our Core Project Office.

Comments on the format and content of this newsletter would be greatly appreciated. We encourage submissions of interest to the PAGES related science community for entry into this report.

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PAST PAGES WORKSHOPS

Coral Paleoclimate Reconstruction

In November 1992, 37 scientists from Germany, India, Puerto Rico, Switzerland and the U.S.A. gathered in La Parguera, Puerto Rico to participate in a PAGES and NSF sponsored workshop entitled "Coral Records of Ocean-Atmosphere Variability". It was the first time researchers met specifically to exchange information on coral paleoclimate reconstruction. The participants included scientists working on coral-based paleoclimate data as well as specialists in climate modelling, tropical climatology and dendrochronology.

The skeletons of long-lived reef corals are a unique and detailed source of information on tropical climate. Chemical and isotopic tracers incorporated in coral skeletons, for instance, can accurately record important changes in environmental parameters such as sea surface temperature and salinity. With their rapid accretionary growth, a single coral core may record seasonal and even monthly climate variation across a time span of several 100 to perhaps 1000 years. Also, because reef corals are commonly well preserved as fossils, they can provide windows into tropical paleoclimatic conditions throughout the Holocene and Late Pleistocene.

The workshop met to discuss how best to exploit the tropical climate record offered by reef corals. The following general themes were discussed at the workshop: the evaluation of methods for coral chronology and climate reconstruction and the numerical analysis of coral-based paleoclimate data; the fidelity and use of new and existing paleo-climate tracers in corals; how coral paleoclimatology can best incorporate techniques and expertise from related fields; and strategies for coordinated studies of key oceanic and atmospheric phenomena using corals.

Workshop participants proposed a long-term research initiative for coral paleoclimatology targeting two broad goals:

- the development of a spatially comprehensive reconstruction of seasonal to century scale variation in tropical ocean-atmosphere systems over the past 500 years.
- the development of coral paleoclimate reconstructions for key time slices (related to known forcings or to extrapolate climate extremes) in order to evaluate the response in the baseline state and variability of tropical climate.

A consistent theme of this research program will be to understand the teleconnections between tropical variability and extratropical change in climate and climate forcings. In the interest of maintaining and improving the technical basis for further coral paleoclimate studies, the workshop stressed the need for further calibration and validation of well known tracers such as ^{18}O as well as those new tracers that appear to show great promise (i.e. Sr/Ca). Research on the physiological aspects of coral growth, tracer uptake and isotope fractionation was strongly encouraged because of its importance in the evaluation of climate tracers and coral chronology verification.

A key product of this meeting has been a preliminary inventory of coral cores that research groups now have available. This inventory includes records of cores from 92 separate sites across the tropics and has served as a prelude to the development of an international database of coral paleoclimatic data. The workshop put together a set of guidelines for coral-database submissions. For more information about submitting or accessing coral data from the paleoclimate database contact Bruce Bauer at the WDC-A for Paleoclimatology at the address listed below or by e-mail (INTERNET: bab©mail.ngdc.noaa.gov).

PAGES/IGBP in Africa

IGBP-START organized an African Workshop on "Africa and Global Change" in Niamey, Niger on 23-27 November 1992. In association with this meeting a working group entitled "Past Climatic Changes in Africa Related to Global Change" discussed PAGES research goals and initiatives for the African continent. Participating scientists from Africa, Europe and North America identified two preliminary foci of common interest for the African PAGES program, the study of African coastal history and paleomonsoons. The group also made some specific recommendations to further PAGES related science in Africa. The compilation and rapid publication of a directory of "paleo" scientists active in Africa was suggested as a way to improve communication between researchers. A suggestion was also made to establish "centers of excellence" at selected African institutions to act as magnets for PAGES focused research projects that might begin to address the long term problem of lack of resources and trained scientists in Africa.

Those interested in PAGES/IGBP activities in Africa should contact:

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FAX: 254-2-33-68-85

PALE Update

The major goals of the Paleoclimates of Arctic Lakes and Estuaries (PALE) are to reconstruct Arctic climatic variation over the past 150000, 20000 and 2000 years and to understand the interaction of this variation with the global climate system. Research is based on a circum-Arctic gridwork of sites analyzed for multiple paleoclimate indicators that are calibrated with modern data and placed in a fine resolution temporal framework. Large-scale controls over Arctic climate and feedback to the global system will be evaluated through sensitivity tests and simulation experiments with general circulation models.

On 21-24 March, 1993, the Far East Branch of the Russian Academy of Sciences hosted a meeting of American, Canadian, Norwegian and Russian scientists in Vladivostok, Russia, to discuss and adopt protocols describing the standard methodology for PALE. The workshop prepared a protocol document summarizing procedures for collecting and analyzing proxy indicators of Arctic climate, dating lake and estuary sediments, and managing data. The meeting also identified two major programmatic needs: 1) modern calibration studies of surficial lake sediments from Russian Arctic/sub-Arctic and parts of the Canadian high Arctic, and 2) AMS chronological control (ca. 1 date per 1000 years) for all paleo-records. Recognizing that programs with similar goals and time-tables have been established in several Arctic-rim countries, participants recommended steps to ensure the close interaction of these and future efforts.

JOINT EFFORTS

WDC-A for Paleoclimatology in Boulder

PAGES has joined with the new WDC-A for Paleoclimatology in Boulder in coordinating the design and implementation of a global, science-driven data management system that integrates all types of paleoenvironmental data needed by the international global change community. The PAGES Core Project Office in Bern, the IGBP/DIS and the WDC-A for Paleoclimatology are working together to establish an easily accessible international data system devoted to the acquisition, management, and distribution of paleo-environmental data. This includes raw primary paleo-environmental and climate data as well as information derived from primary sources such as chronologies and climate estimates and reconstructions. Also archived are modern calibration data needed to convert basic paleoclimatic and environmental information into quantitative estimates of past climate, ocean, or biosphere conditions.

Since the acquisition and international exchange of such data is a central focus of the PAGES effort to understand paleoenvironmental change, we strongly encourage interested scientists to contribute or exchange their data with the rapidly growing WDC-A holdings. We are also assisting formal international efforts to coordinate with specific proxy data communities to build new databases and expand upon earlier compilations.

A key application of the collection and interpretation of paleoenvironmental data must be the development and validation of predictive climatic models. The record of past climate change provides a unique proving ground for testing the ability of different GCM's to simulate specific past environmental conditions and climatic changes. Therefore, PAGES is taking part in an international effort established to compare the ability of 12 major climate models to simulate known climatic conditions at selected times in the past, the NATO-sponsored Paleoclimate Model Intercomparison Project (PMIP). WDC-A has been designated to archive and distribute digital boundary conditions files for GCM simulations of 6000 and 18000 yr. B.P. The data center will work closely with PMIP to provide paleo-climate estimates to be used in assessing the simulations. For more information on WDC-A for Paleoclimatology contact Dr. Jonathan Overpeck (see address below).

UPCOMING WORKSHOPS

PAGES Data Management Coordination Workshop

On 23-25 August 1993 in Bern, Switzerland, PAGES will sponsor a Data Management Workshop aimed at building a strong consensus for the handling of future data management issues. Workshop co-convenors Jonathan Overpeck and Jonathan Pilcher are bringing together representatives of the major paleoclimate data producing/managing efforts from around the world. Workshop goals include:

1) updating the community on the progress of the PAGES data management effort;

2) establishing draft protocols for PAGES data management and sharing;

3) improving technical goals of the PAGES data management strategy;

4) identifying data sets that should be included in the PAGES data base, and those residing in other IGBP or global change data bases that should to be accessible to PAGES scientists; and

5) devising strategies for maximizing the participation of scientists in the PAGES data sharing endeavor.

The workshop will produce a data management document outlining a protocol for sharing, accessing and managing PAGES data. A PAGES Working Group in data management will be established to ensure that PAGES goals are met. Contact Jonathan Overpeck (WDC-A, Boulder) for more information.

World Data Center-A for Paleoclimatology
NOAA National Geophysical Data Center
325 Broadway, E/GC
Boulder, CO 80303 USA
Tel: 303 497-6227
FAX: 303-497-6513

Late Quaternary Climates in the Americas, PEP

On 30 Sept. -2 Oct., 1993, PAGES will sponsor a workshop of the Pole-Equator-Pole Research Initiative in Panama City, Panama. The theme of the workshop is "Late Quaternary Paleoclimates in the Americas: Dynamics of Past Climate Change and its Forcing along a Transect from Pole to Pole". The PEP initiative was formed as an inter-American paleoenvironmental research program focusing on the dynamics of transequatorial atmospheric and oceanic climatic linkages.

The meeting will focus on improving understanding of the interhemispheric mechanisms of climate forcing active over the last 18000 years. Participants from the Western Hemisphere, Europe and Asia will also put together an inventory of the types of present and past

climatic information available and explore the possibilities for coordinated data compilation. This goal will be approached with an eye toward the establishment of a broad based data bank detailing paleoclimates across a pole to pole Western Hemisphere transect.

For more information about PEP and the up-coming Panama workshop contact:

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CALL FOR TITLE SUGGESTIONS

Our present unimaginative title "PAGES News" is temporary . We are canvassing our readers for title suggestions. The best suggestion submitted to our Core Project Office will be used in future issues of the PAGES newsletter. The winning entry will be handsomely rewarded. Please keep in mind, however, that handsome is a relative term.

PAGES FUTURE MEETINGS

17-19 June 1993- **PAGES Executive Committee Meeting;** Bern, SWITZERLAND. Contact: PAGES Core Project Office, Bern.

21-25 June 1993- **PAGES Project Planning Meeting: NAD (Nansen Arctic Drilling)**; Solstrand, NORWAY. In conjunction with the Nansen Centennial Symposium. Contact: Dr. T. Vorren, NORWAY.

23-25 August 1993- **PAGES Workshop: Data Coordination for Paleoclimatology**; Bern, SWITZERLAND. Contact: Dr. J. Overpeck, USA (TEL +303/492-5117; FAX: +303/492-6388).

26-27 August 1993- **PAGES Workshop: Ice Core Data; Bern**, SWITZERLAND. Contact: Dr. J. White USA (TEL:+303/492-5484; FAX: +303/492-6388).

30 Sept-2 Oct 1993- **PAGES Workshop/Project Meeting: Late Quaternary Paleoclimates in the Americas, PEP (Pole-Equator-Pole)**; Panama City, PANAMA. Contact : Dr. V. Markgraf, USA (TEL: +303/492-5117; FAX: +303/492-6388).

13-15 October 1993- **PAGES/SSC Core Project Open Meeting**; Washington, DC, USA. Contact: Dr. H. Zimmerman, USA (TEL: +202/357-9892; FAX: +202/357-3945).

22-26 October 1993- **NATO Advanced Research Workshop: Strategies for the Use of Paleoclimate Data Sets in Climate Model Intercomparison and Evaluation**; Aussois, FRANCE. Contact: Dr. J. Guiot, Marseille FRANCE.

1-3 December 1993- **PAGES Workshop: Extracting Climatic and Other Environmental Signals from Millennial-Aged Tree-Ring Chronologies**; Tucson, AZ, USA. Contact: Dr. D. Graybill, USA (TEL: +602/621-6469; FAX: +602/621-8229).

4-5 February 1994- **PAGES/PALE Principal Investigators Meeting**; Boulder, CO, USA. Contact: Dr. John Andrews, USA (TEL: +303/492-8347; FAX: +303/492-6388).

14 August 1994- **Workshop on PAGES Chronologies- Dating Techniques and Comparability of Chronologies**; Glasgow, United Kingdom. In connection with the 15th International Radiocarbon Conference. Contact: Dr. W. Mook, NETHERLANDS (TEL: +31-2220/69366; FAX: +31-2220/19674).