PEP I

PAGES - PEP CONTINENTAL DRILLING EFFORTS

uch of our present understanding of the **V** long-term behavior of the earth system is based on the great number of long, continuous paleoclimate records from the deep sea and polar ice caps. Comparable long paleoclimate records from the continents, on the other hand, are relatively scarce, despite the fact that they are unique in providing insight into how global and regional climates influence the biosphere upon which humanity is most intimately dependent (see figure of sites with existing and proposed long records along the PEP I transect). To promote and develop a framework for long continental records a PAGES workshop entitled "Continental Drilling for Paleoclimate Records" was convened in Potsdam in 1995, in conjunction with the newly formed International Continental Drilling Program (ICDP). ICDP's goals are to assist in development of major continental scientific drilling projects throughout the world, undertaken to understand, among several other themes, the manner in which Earth's climate has changed in the recent past and the reasons for such changes. The recommendations from this workshop have been published by PAGES (PAGES Series 96-4).

To help coordinate the fragmented continental paleoclimate community and to further the ICDP-PAGES collaboration, one of the outcomes of the PAGES Continental Drilling Workshop was establishment of a lake drilling task force to develop a prospectus for lake drilling projects linked to the science agenda of the PAGES-PEP transects. Following solicitation of lake drilling planning proposals from the international science community, the task force evaluated and prioritized the proposed projects and submitted a prospectus for a 5-year global lake drilling initiative to the ICDP Steering Committee in April 1996, for



PEP I: lake drilling network

their consideration. At the same time, some projects that were ready to proceed submitted individual pre-proposals to ICDP.

A workshop sponsored by ICDP took place in December, 1996, to facilitate ICDP's consideration of the proposed PAGES-PEP lake drilling projects. Because ICDP funds are limited, among other reasons, the PAGES lake drilling plan is meant to be used by the research community to approach all potential funding sources for lake drilling projects, nationally and internationally.

PEP I RESEARCH AND WORKSHOP ACTIVITIES

With the support of the recently established Inter American Institute for Global Change Research (IAI) several working groups have formed to coordinate interdisciplinary research that addresses the Americas' interhemispheric paleoclimate agenda.

IAI Funded PEP I Related Projects

• Vegetation History from Fossil Rodent Middens in the Mid- latitude American Deserts (J.L. Betancourt, V. Markgraf, L. Graumlich)

Fossil rodent middens from the deserts in South America (Argentina, Bolivia, Chile, Peru) will be collected and analyzed for comparison with packrat middens from North American deserts (USA and Mexico) to resolve questions on human impacts on semi-arid rangelands; on how climatic extremes and variability affect long-term vegetation dynamics, biogeography and biodiversity in deserts; and on the interhemispheric interrelation between climate change.

• Ice-core Study on the Environment and Climate of the Antarctic Peninsula and the Southern Part of South America (Laboratorio de Estratigrafía Glaciar y Geoquímica del Agua y de la Nieve (Argentina); Laboratório de Pesquisas Antárticas e Glaciológicas (Brazil); Department of Geography, University of Calgary (Canada); Laboratoire Glaciologie et Géophysique (France)

Ice core samples from the Antarctic Peninsula and the Patagonian Icefield will be recovered and analyzed at annual to decadal resolution to identify atmospheric and climatic variability for the last 1000 years.

PEP I

IAI Funded Workshops

• Potential Use of Biological Proxy Data as Climatic Change Impact Indicators in South American Ecosystems (C. Villagrán (Chile), M. Paez, A. Prieto, R. Villalba (Argentina), M.L. Lorscheitter (Brazil)

During a workshop held in Puerto Alegre, Brazil, in July 1996, members from the paleoclimate community developed a research agenda to evaluate the environmental impacts of future climate change on subtropical ecosystems in Argentina, Brazil and Chile. The proposed approach focuses on analysis of multiproxy paleoclimate records for specific time slices in the past, considered potential analogs for future change.

To enhance the paleoenvironmental response, records will primarily be developed along transects in ecotonal regions;

1) from the Pampas to the Espinal thornscrub, and to the Monte desert;

2) from the Patagonian steppe to the Monte desert, across the Andes, and into the Central Chilean lowlands.

Highest priority in terms of facilitating future collaborative research was considered to be the development of educational and communication aspects. These include development of short courses on different topics in Latin American paleoclimates, such as on climate variability, past, present, and future; the development of paleoenvironmental and paleoclimate bibliographic databases, and of other databases related to the proposed research. (Excerpt from workshop report by C. Villagrán)

• The Assessment of present, Past and Future Climate Variability from Treeline Environments in the Americas (B. Luckman, Canada)

The western cordillera of the Americas comprise the most complete terrestrial latitudinal transect on earth and flank its largest ocean. These mountains contain several ecotonal environments that have a proven potential to yield high quality multidisciplinary historical and paleo-climate data that can be used to address questions of climate variability at a large range of spatial and temporal scales. To focus on the potential of these ecotones within the context of the PAGES PEP-I transect a workshop entitled "The Assessment of Past, Present and Future Climate Variability in the Americas from Treeline Environments" was held at Jasper in the Canadian Rocky Mountains, October 6th to 10th, 1996. The workshop brought together climatologists, ecologists, paleoecologists, dendroclimatologists, and glacial geologists working in treeline environments in Argentina, Chile, Bolivia, Peru, Central America, Mexico, the US and Canada. The

goal of the meeting was to develop an interdisciplinary research agenda to address the response of treeline environments to recent and future natural and human related changes and the implications of these changes for natural resources in mountain environments. The proposed strategy is to establish an interhemispheric network of climate and climate proxy data, from Alaska to Tierra del Fuego, at a nested range of spatial and temporal scales. Such a data set would allow examination of the local and regional patterns of interannual and longer term climate variability and ultimately shed light on the causes of change. Concurrent studies of contemporary environmental responses (e.g. at treeline, snow-line and by glaciers) will be used to benchmark the response of these systems to change. Co-funding for the workshop was received from NSF-PEP I, the Canadian government agencies of Atmospheric Environment Service, Environment Canada, Geological Survey of Canada, University of Western Ontario, Jasper National Park, and the Laboratory of Tree Ring Research, University of Arizona.

Fire and Global Change in Temperate Ecosystems of Western North and South America (T. Veblen, US)

A workshop funded by a Phase I grant from the Inter-American Institute and held in Oregon in September 1996 under the auspices of AMIGO (America's Interhemispheric Geo-Biosphere Organization) brought together scientists from Canada, the US, Argentina and Chile, to discuss a research agenda that would address the role of fire in ecosystem response to global change. The proposed approach focuses on the studey of present and past fire regimes, using dendrochronological and sediment charcoal analysis, across a range of biomes at different spatial and temporal scales in temperate ecosystems of western North and South America. An interhemispheric comparison of fire regimes under different present and past land- use practices, different biotic and abiotic conditions and disturbance regimes, different modes of climate and climate variability, etc., may help disentangle the influences of climate and human activities, a problem of great concern for future land management.

• Comparative Studies on Oceanic and Coastal Processes in Temperate Zones of the Eastern Pacific (T. Baumgartner, USA)

The workshop was held in Vina del Mar, 11-16 November 1996, and brought together 52 scientific experts from Chile, Peru, Mexico, the United States and Canada. The purpose was to design a research program which would implement the goals of IAI's Research Theme "Comparative Studies of Oceanic, Coastal and Estuarine Processes in Temperate Zones" for the oceanic and coastal zones of the eastern Pacific, with their distinctive Upwelling and Eastern Boundary Current Ecosystems. The workshop provided the opportunity to create an umbrella strategy to guide development of an overall Science Implementation Plan which included specific Research and Training projects focused on the coastal and oceanic ecosystems extending from the intertidal zone to the pelagic region (0-200 km offshore). The science agenda and initial implementation plans developed focused on the following topics:

1) Large-Scale Climate (the framework of interannual, interdecadal and centennial climate change),

2) Atmospheric Forcing and Ocean Circulation in the Eastern Boundary Currents,

3) Nutrient and Plankton Dynamics,

4) Near-Shore Ecosystems,

5) Long-term Ecosystem and Climate Histories (Paleo-ecology / Paleo-oceanography/ Paleo-climatology),

6) The Human Dimensions: Socio-Economic Issues and Consequences.

• Workshop on High Resolution Climate Records from High Elevation Ice Cores in the Americas (R. Bradley, D. Hardy, USA)

To explore the opportunities for research on climate variability in the Americas from high elevation ice cores, a group of 20 scientists representing 11 countries met in San Carlos de Bariloche, Argentina from 11-13 December, 1996. The Workshop focused on the objectives outlined in the PAGES PANASH document (PAGES Report 95-1) for studies along the PEP-I transect.

Discussions focused on regions of the Americas from which additional ice core records could be recovered, and the value of each location in terms of understanding climatic variability. The geographical scope of the workshop discussion extended from the Antarctic Peninsula (~75°S) to northern Ellesmere Island (83°N). The meeting was financially supported by the Inter-American Institute for Global Change Research (IAI). The primary goals of the workshop were to identify both the principal scientific questions which can be answered, and societal issues which can be addressed, by ice core studies along a North-South transect through the Americas, to determine which ice caps have the potential of yielding high resolution paleoenvironmental records, and to initiate discussions on programs of collaborative research.

The first session of the workshop was devoted to presentations reviewing the current state of knowledge in three areas: 1) Circulation regimes of South America and

1) Circulation regimes of South America and meteorological observations at high elevations; (continued on page 4 bottom)

eu on puge 4 borror

PEP II

This report on PEP II activities uses selected abstracts and presentations from the 1995 Nagoya Symposium to illustrate the strength and diversity of the research being carried out within the vast and complex region spanned by the Transect. A full account of the Meeting and the Abstracts of all the papers can be found in: Mikami, T, Matsumoto, E., Ohta, S. and Sweda T. 'Paleoclimate and Environmental Variability in Austral-Asian Transect during the past 2000 years'. Proceedings of the 1995 Nagoya IGBP-PAGES/PEP-II Symposium, Nagoya. (277pp.).

NEW ZEALAND

Tree-ring records from subantarctic forests in New Zealand



Fig. 1 - Left: Map of New Zealand's North and South Islands and Stewart Island. Manapouri is location of another pink pine site. Ahaura and Mangawhero River Bridge are silver pine sites. Right: Map of Stewart Island and vicinity showing location of pink pine tree-ring sites. DB, Doughboy Bay; RK, Mt. Rakeahua; PG, Pegasusan. Most recent collection (1995) was from Hellfire (HF) site, Ruggedy Mountains, northwestern Stewart Island. (in D'Arrigo, Buckley, Cook, Wagner, "Temperaturesensitive tree-ring width chronologies of pink pine from Stewart Island, New Zealand", in press)

The New Zealand Government has agreed to fund NZ\$300k for drilling of Lake Poukawa on North Island. This is one of the key sites identified as a part of the ICDP.

JOHN DODSON

emperature-sensitive tree-ring width chro nologies for the Southem Hemisphere include several we have recently produced for pink pine (Halocarpus biformis) from Stewart Island, the southernmost of the three main islands of New Zealand (D'Arrigo et al. a and b. in press). These chronologies are positively correlated with warm-season land and marine temperature records for southern New Zealand and vicinity. We have also developed chronologies of silver pine (Lagarostrobus colensoi), closely related to the huon pine (L. franklinii) of Tasmania, for two sites: Ahaura, South Island, and Mangawhero, North Island, New Zealand. Both are updated from series originally published by LaMarche et al. in 1979.

Although there are shorter intervals of comparable warmth, the highest 20-year periods of growth during the past 300 or more years of record for Stewart Island occurred during the middle 1950s-1970s, coinciding with record warming since around 1950 in New Zealand. The updated Ahaura and Mangawhero series also show above-average growth during the recent warm period, with the highest 20-year growth intervals since 1350 occurring in recent decades.

(continued on next page)

(continued from page 3 - PEP I) 2) Methodological techniques and issues of ice core analysis;

3) Regionally-specific research accomplishments related to glacier-climate interactions and ice core drilling in the Americas.

Discussions were then conducted on individual regions of the Americas where there are excellent prospects for recovering paleo-environmental records from ice cores. Specific needs and ideas for research projects in each region were identified and plans were laid out for integration of the various projects into a proposal to be submitted to IAI in 1997.

Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) (C. Nobre et al., Brazil)

To foster understanding of regional-scale transport in Amazonia, of energy, heat, moisture, carbon and other trace constituents, and their interactions and feedbacks, process studies at local to meso-scale are proposed, coordinated under the LBA experiment. To disentangle the role of human impact from natural environmental and climate variability, these experiments include a paleoclimate component, that focuses on identification of the effects the different past precipitation and temperature modes on Amazonian ecosystems. The proposed plan, jointly developed by B. Turq (ORSTOM, Brazil) and P. Colinvaux (Smithsonian, US), calls for development of a network of multiproxy paleoclimate records analyzed with decadal to millenial time resolution. The network of paleoenvironmental records overlaps the network of sites proposed for hydrological, biochemical, and ecological process studies.

• Dendrochronological Studies in Tropical South America with Special Emphasis on Bolivian Forests (J. Boninsegna, R. Villalba, F.A. Roig (Argentina), J. Argollo, S. Beck (Bolivia))

Field reconnaissance, collection and dendrochronologic analysis of different tree taxa from the subtropical and tropical forests in South America should provide information on the potential of tree-ring research for paleoclimate in these poorly known environments.

SUBMITTED BY DR. VERA MARKGRAF

Institute of Arctic and Alpine Research University of Colorado Boulder, Colorado 80309-0450, USA Phone: 303 492 5117 Fax: 303 492 6388 e-mail: markgraf@spot.colorado.edu

1