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PAGES
PAST GLOBAL CHANGES

PAGES IN THE ANTARCTIC

The Global Change and the Antarctic (GLOCHANT) Programme of the Scientific Committee on Antarctic Research (SCAR) co-sponsors three programmes with PAGES, on Antarctic climate and environmental history.
These palaeoclimate and palaeoenvironment programmes are focused on the last 200,000 years, as recorded in deep ice cores (Palaeoenvironments from Ice Cores (PICE) programme), circum-Antarctic onshore and offshore sediments (Late Quaternary Sedimentary Record of the Antarctic Ice Margin Evolution (ANTIME) programme). A high resolution history covering the last 200-500 years and the period of greatest anthropogenic change, is the focus of the shallow to medium depth ice cores (International Trans-Antarctic Scientific Expedition (ITASE) programme).

ITASE

200 Years of Past Antarctic Climate and Environmental Change

Cambridge, UK, August 2-3, 1996

As a consequence of this international meeting a science and implementation plan has recently been completed and published in the PAGES Workshop Report, Series 97-1. The ITASE Executive Summary is reproduced below.
Copies of the report can be obtained from the PAGES Office, or the SCAR Global Change Programme Office, Antarctic CRC GPO Box 252-80, Hobart 7001 Tasmania, Australia.

ITASE Science and Implementation Plan Executive Summary

From its original formulation in 1990 the International Trans Antarctic Scientific Expedition (ITASE) has had as its primary aim the collection and interpretation of a continental-wide array of environmental parameters assembled through the coordinated efforts of scientists from several nations. *(continued on page 2)*

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PAGES International Project Office, Bärenplatz 2, CH-3011 Bern, Switzerland - Tel: +41 31 312 3133, Fax: +41 31 312 3168, e-mail: pages@pages.unibe.ch, http://www.pages.unibe.ch/

EDITORIAL

Do recent ENSO anomalies reflect natural variability or anthropogenic effects – or both?

The strong El Niño event which developed in 1997 has wrought havoc in many parts of the world – floods in Ecuador and Peru, unusually intense and frequent landfall of hurricanes in Mexico, drought and forest fires in Indonesia and Malaysia and heavy rainfall in the south-western United States. Satellite-based sensors reveal the enormous area of positive sea surface temperature anomalies which developed in the eastern Equatorial Pacific in the latter half of 1997 (see http://www.ogp.noaa.gov/enso) raising the question: how unusual is this situation? Satellite observations are recent and provide only a limited temporal perspective on the current event. A longer-term view is provided by the Southern Oscillation Index (SOI) which is based on the sea-level pressure difference between Tahiti and Darwin. The series extends back reliably to 1935 and although the discovery of early pressure data from Tahiti allowed a century-long series to be constructed (Ropelewski & Jones 1987) doubts have been raised about the reliability of these data (Trenberth 1997). Darwin pressure data appear to be more homogenous, but they can only provide a limited perspective on the overall complexity of the large-scale ENSO System. However, in spite of their limitations, all of these records point to the 1997-98 El Niño event as truly extraordinary — comparable in magnitude to the "previous record" of 1982-83, but with a different temporal evolution of the anomaly field. Furthermore, the current El Niño comes on the heels of a sequence of warming events, spanning much of the period from 1990-1995 (Goddard & Graham, 1997); indeed, since 1976 there have been relatively few cold events and many more warm events suggesting to some that there has been a fundamental change in the climate system, brought about by anthropogenic increases in greenhouse gases. According to Trenberth & Hoar (1996, 1997) the sequence of 22 positive seasoned sea-level pressure anomalies at Darwin from 1990-95 (relative to the 1882-1981 mean) and their large magnitude, implies a return period of approximately 8850 years. They argue that such an occurrence is unlikely to be entirely due to natural variability and that anthropogenic effects are implicated. However, Rajagopalan *et al.* (1997) re-examine this claim using a non-parametric statistical analysis and conclude that the return period for such a sequence of anomalies is very sensitive to the statistical model applied to the data and to the reference period selected. In particular, because climate sensitivity in the Tropics consists of inter-annual, inter-decadal and lower frequency (centennial-scale) modes (Mann & Park 1994; Latif et al. 1997; Zhang *et al.* 1997) the calculation of ENSO return periods is a particularly difficult task when records are short. Accordingly, Rajagopalan *et al.* (1997) show that the 1990-95 run of positive anomalies can be viewed as having a return period ranging anywhere from 79 to 3250 years, depending on the record length and model selected.

High resolution paleoclimatic data can shed light on this controversy. Geochemical studies of banded corals have demonstrated they are extremely good proxies of intra-annual changes in SST and/or rainfall in the tropics. The PAGES 'ARTS' project (Annual Records of Tropical Systems) focuses on using such records together with tree-rings, low latitude ice cores and varved sediments to reconstruct multi-century length records of tropical climatic conditions. Research focuses on extracting reliable records of climate variability, ranging from inter-annual to century timescales. By extending the record of tropical climate variability back in time, and expanding the spatial coverage of data across the Tropics, a more comprehensive view of the spatio-temporal variability of ENSO events will be obtained. Until this happens, arguments over whether recent conditions in the Pacific are attributed to natural variability of or anthropogenic effects (or both) will be difficult to resolve.

(See page 4 for references)

Ray Bradley
Chairman, PAGES SSC

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Because of the remoteness of the continent, Antarctica is an ideal location to monitor biogeochemical cycles and local-to-global scale climate change. However, this remoteness has also prevented the collection of instrumental records, similar to those collected in the northern hemisphere, that are required to assess Antarctica's role in and response to environmental and climate change.

As a consequence ITASE has been focused to address two key scientific objectives:

- To determine the spatial variability of Antarctic climate (eg. accumulation, air temperature, atmospheric circulation) over the last 200 years, and where the data are available the last 1000 years.

These variations include: major atmospheric phenomena such as ENSO; snow accumulation variations; and extreme events such as volcanic eruptions and storms.

- To determine the environmental variability in Antarctica over the last 200 yrs, and where the data are available the last 1000 years.

Environmental proxies could include: sea ice variation, ocean productivity, anthropogenic impacts; and other, extra-Antarctic continental influences.

In fulfilling these objectives ITASE will: produce continental scale "environmental maps"; elucidate transfer functions between components of the atmosphere and snow/ice; verify atmospheric models; and interpolate spatial time-series determined from satellite remote sensing. ITASE was adopted as a key science initiative by both the International Geosphere-Biosphere Program (IGBP) and the Scientific Committee on Antarctic Research (SCAR). In August 1996 a SCAR/GLOCHANT-IGBP/PAGES sponsored workshop was held to develop this Science and Implementation Plan for ITASE. Whilst the ITASE programme will focus on obtaining a spatially contiguous Antarctic palaeoclimatic and palaeoenvironmental data set for the last 200 years, longer records spanning the last 500-1000 years will also be retrieved on an opportunity basis. The combined palaeodata set will fill a significant void in our knowledge of Antarctic climate variability.

The ITASE programme is managed and coordinated through the SCAR Global Change Programme (GLOCHANT) Office, located at the Antarctic CRC in Hobart, Tasmania, Australia. All correspondence on planned and operational ITASE field traverses, firn/ice core analyses, and existing Antarctic palaeo-climatological and palaeo-environmental data banks should be made through the Programme Coordinator, Dr Ian Goodwin (e-mail: ian.goodwin@utas.edu.au).