

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.

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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 palaeoclimatological and palaeo-environmental data banks should be made through the Programme Coordinator, Dr Ian Goodwin (e-mail: ian.goodwin@utas.edu.au).

PAGES/GLOCHANT ACTIVITIES

Region 7: Links the sedimentary record in the Maudheimvidda, and offshore on the continental shelf in the Haakon VII Sea, with the potential ice core record from the planned EPICA ice cores;

Region 8: Links the sedimentary record in the Shackleton Mountains with the record in the Thiel Trough, Filchner Embayment and in the eastern Weddell Sea, together with the ice core record from Berkner Island;

Region 9: Covers the sedimentary record in the Ellsworth Mountains, and along the Orville and Lassiter Coasts,

Region 10: Covers the sedimentary record together with the Antarctic Peninsula ice core records from two transects; the east-west meridional record across the Antarctic Peninsula in Graham Land, and; the north south zonal record along the Antarctic Peninsula from the South Orkney Islands, South Orkney Rise, South Shetland Islands, and down the Davis and Danco Coasts. A series of ODP drill cores is planned in the Palmer Deep from which a high resolution sedimentary record is expected to cover the Late Quaternary;

Region 11: Covers the sedimentary record from the eastern end of Alexander Island, with that from Marguerite Bay, and the continental shelf in the Bellingshausen Sea;

Region 12: Covers the sedimentary record from the inner continental shelf in the Pine Island Glacier trough, and offshore in the Amundsen Sea.

Research in these regions will include:

- the delineation of glacial extent and volume;
- the stratigraphy of glacial retreat;
- development of chronological control between continental shelf and onshore records;
- depiction of palaeo ice sheet and ice stream morphology, the relationship between ice sheets and continental shelf banks, and similarly between ice streams and shelf troughs;
- the interpretation of high resolution event stratigraphy for the Holocene, from: sedimentary investigations in lake, coastal, fjord, and shelf sequences; together with the high resolution ice core records from coastal ice domes.

A scientific advisory committee was selected for the ANTIME programme at the Hobart workshop, such that all national programmes and Antarctic sub-regions were represented. The nominated scientific advisory committee is as follows:

Prof. Eugene Domack, Hamilton College, USA, Co-Chairman,

Prof. Ross Powell, Northern Illinois University, USA, Co-Chairman,

Dr. Ian Goodwin, SCAR Global Change Programme/Antarctic CRC, Australia, ANTIME programme coordinator,

Prof. John Anderson, Rice University, USA, West Antarctic Ice Sheet (WAIS rep),

Dr. Paul Berkman, Ohio State University, USA,

Dr. Peter Harris, Antarctic CRC, Australia
Dr. Kazuomi Hirakawa, Hokkaido University, Japan,

Prof. Christian Hjort, Lund University, Sweden,

Dr. Mike Bentley, University of Edinburgh, UK,

Dr. Carol Pudsey, British Antarctic Survey, UK, ODP representative Antarctic Peninsula sector,
Dr. Rainer Gersonde, Alfred Wegner Institute, Germany, ODP/IMAGES representative, Atlantic sector,

Dr. Will Howard, Antarctic CRC, Australia, ODP/IMAGES representative, Indian and Pacific sectors,

Dr. Miquel Canals, Universidad de Barcelona, Spain, and,

Dr. Marco Taviani, Instituto di Geologia Marina, Italy,

ANTIME Workshop Abstract Volume

Limited copies of the workshop abstract volume are available from the GLOCHANT office: Goodwin, I. D. (ed) 1997. Late Quaternary Sedimentary Record of the Antarctic Ice Margin Evolution (ANTIME), Workshop Abstracts, GLOCHANT-PAGES, Hobart, Australia, 6-11 July, 1997, 84 pp.

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GLOCHANT/PAGES workshop on palaeo-environments from ice cores

LANZHOU, CHINA, SEPTEMBER 1998

A GLOCHANT-PAGES sponsored workshop is proposed to be held in Lanzhou, China, in September 1998, in conjunction with the 6th International Symposium on Antarctic Glaciology, 5-9 September, 1998.

The workshop will focus on:

- Comparison of regional and bipolar palaeoclimatic records over glacial cycles and the Holocene from deep ice cores;
- Ice-core data sharing and coordination; and, possibly
- Comparative ice core and marine records.

For more information contact:

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RECENT PROGRESS ON ANTARCTIC DEEP ICE CORING

The Japanese Antarctic Research Expedition's (JARE) deep drilling project at Dome F (77°19' 01" S, 39° 42' 12" E, 3,810 m) in central East Antarctica, has been completed over a 2 year period to a depth of 2,504 m. Ice core has been retrieved from the entire depth and analyses are in progress. The preliminary $\delta^{18}\text{O}$ oxygen isotope analyses indicate that the core covers the last Glacial cycle back to ~170,000 years B.P. The preliminary results were presented at the Antarctica and Global Change Symposium held at the Antarctic CRC, Hobart, Tasmania, Australia, from 13-18 July, 1997. The results confirmed that the higher snow accumulation rate at Dome F site than at Vostok, will enable a potentially higher resolution palaeoclimatic record from Dome F over the last Glacial cycle.

Further information can be obtained by contacting:

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