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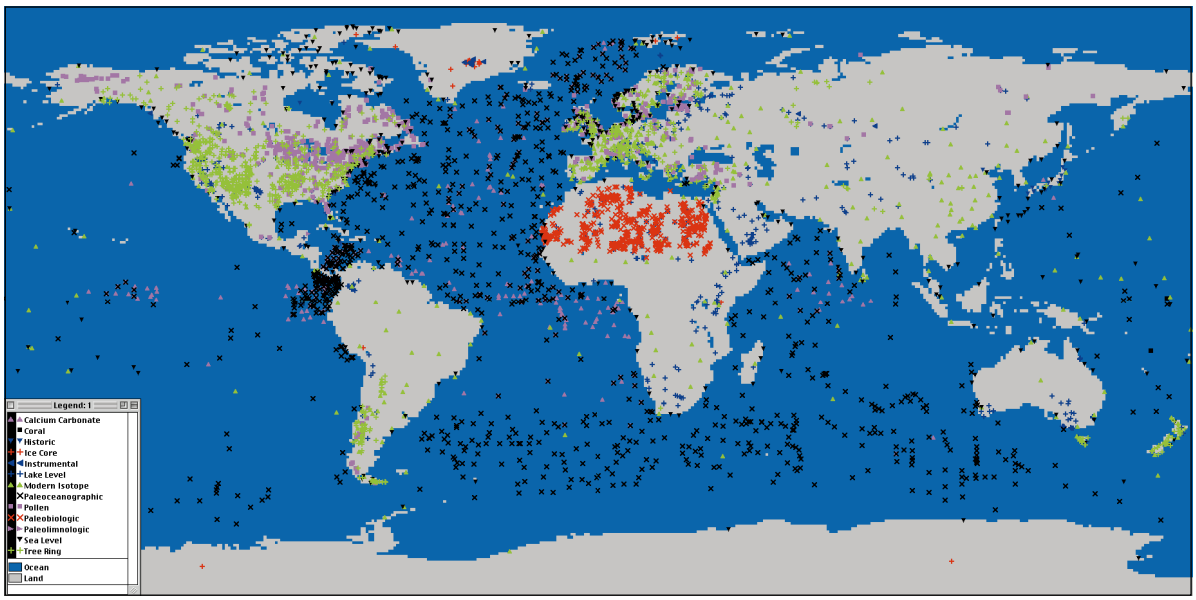
NEWS OF THE INTERNATIONAL PALEOSCIENCE COMMUNITY
A CORE PROJECT OF THE INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME **IGBP**

PAGES

PAST GLOBAL CHANGES

PALEODATA



Georeference map of all paleodata available from WDC-A (map produced with PaleoVu*–see page 4)*

EDITORIAL

The Responsibilities of Data Sharing and Data Use

The present issue of the PAGES Newsletter has a special focus on data, one of the key "fuels" of PAGES research and an important and ever-increasing future legacy of the IGBP. Newsletter contributions are included that illustrate a range of data efforts in different parts of the world.

Part of the responsibility of PAGES is to encourage integration of data to produce regional or global syntheses for -

- understanding the patterns of past changes in climate and the environment
- establishing how these relate to forcing mechanisms and
- providing accurate reconstructions of climate that can be used to test model simulations

These objectives recognize that often "the whole is greater than the sum of the parts" and that new insights may be achieved from assessing large data sets that could not be obtained from studies of individual sites. In response to these objectives, PAGES works towards: transferring the highest possible proportion of existing and new, high quality data into public domain databases; ensuring the compatibility of all relevant paleo-data held in the public domain; fostering the highest degree of quality control achievable; supporting the use of a federated system of national, regional and project databases, as well as the World Data Center-A (WDC-A) for Paleoclimatology, which serves as the global data coordination, access and archive point for PAGES; promoting the highest standards of interaction between data providers and all those who develop, manage and make use of databases. Part of the responsibility of PAGES through the WDC-A, is to ensure that where databases are developed independently, they are sufficiently compatible with WDC-A and with each other to allow their use in combination in order to address questions of past environmental change on a global scale.

The above mentioned responsibilities are imposed by the nature of Global Change research and are not a simple matter of individual preference or scientific fashion. Understanding the behaviour of the earth system on any scale other than that represented by a single archive or proxy requires some degree of data sharing and integra-

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Editorial, continued from front page

tion. One of our greatest challenges is to achieve widespread sharing and integration of data without compromising data quality, and in a way that fully acknowledges and, wherever possible, highlights the role of all who provide data for use by the wider scientific community. This requires a high level of cooperation and mutual trust between the many data providers and the smaller number of scientists who manage the data, or work with data in a synoptic way as part of their own research efforts. It is all too easy to reinforce the asymmetry of this relationship in thoughtless ways. In introducing this issue of the Newsletter, we therefore take the opportunity to emphasize the following:

- all publications using data produced by other scientists have an obligation to clearly acknowledge these other scientists, and to cite the publications where the data were first presented
- a similar obligation rests with all those who use data produced by others in oral presentations, particularly when presentations are made at high-profile national or international conferences
- all who peer-review scientific publications have the responsibility to make sure data sources are always acknowledged and/or cited

The data community within PAGES understands that submitting high quality, adequately referenced data to publicly accessible databases is both a selfless acknowledgement of wider research needs and often an act of intellectual altruism, even though it is reinforced by the stated policy of the IGBP and many funding agencies. It places the "receivers", "managers" and "users" under an obligation to find realistic ways of both recognising and rewarding the generosity of all who submit their data. It also reinforces the need for all of us to work towards database access that is truly easy and open to all, irrespective of their location and interests.

The PAGES Scientific Steering Committee
The members of the PAGES SSC are listed at
http://www.pages.unibe.ch/people/ssc.html

Review of the Greenland Summit Ice Cores CD-ROM

Superlatives abound when discussing the Greenland Summit ice core projects. The two deepest ice cores drilled in the Northern Hemisphere, both investigated in seemingly exhaustive detail by a cast of hundreds to provide two of the longest and most comprehensive paleoclimate data sets available. To aid in a condensation and synthesis of this priceless data set a CD-ROM has now been compiled, containing a large amount of the analysis data from the two projects. It is available free in a self-contained package designed to work on both PC and Macintosh platforms.

The two projects are the Greenland Ice Sheet Project Two (GISP2) and the European Greenland Ice Core Project (GRIP) undertaken between 1989 and 1993. The cores were drilled down to the bedrock, over 3000 m, on the summit plateau of the Greenland ice cap about 30 km apart. The aim was to produce a detailed paleoclimatic record stretching back over 100,000 years. The close proximity of the cores would allow a unique intercomparison of the core data.

I am pleased to say that the CD-ROM is, in general, pretty easy to use and well thought out. From the table of contents there are links to all the main sections: a couple of short introductory articles, the data, a bibliography, an excellent search engine for both authors and analysed data, and a plotting program. The introductory articles describe the basics of the cores, what was measured, and to an extent, the more important results. I was a little disappointed that there was not also a background article included here, explaining "what tells you what". It seems the user must already be familiar with the differences one might expect between say methane and carbon dioxide timeseries, or at least have a text book handy. Some excellent photos in the article would have been more informative with captions.

The primary purpose of the CD-ROM would appear to be to make easily available the large number of data sets produced from the cores. This is done through tables of the data, in a reassuringly simple ascii format. A header describes the data and notes the references that should be cited upon use of the results. Also included on the CD is the *PaleoVu* plotting package, which is easily run either from the CD or after downloading onto your computer. The package itself is alarmingly simple, to the extent that it did become a little limited after a while, and for publication quality plots, the user might find it easier to import the relevant data into their favorite plotting program. However the simplicity was certainly a bonus in obtaining plots within minutes, and I was soon happily plotting away, for example, methane or isotopic oxygen against either depth or years. A memo button on the plotting interface pops up the data header, reminding you what you are looking at and which references to cite, although rather annoyingly this memo button is not visible unless you expand the plotting window.

Putting such minor quibbles aside, I found the CD-ROM suitably self-contained and easy to use. I am sure it will be of great use to the professional paleoclimate community wishing to lay their hands on a hitherto elusive timeseries, and also as an educational tool if supplemented with some background material.

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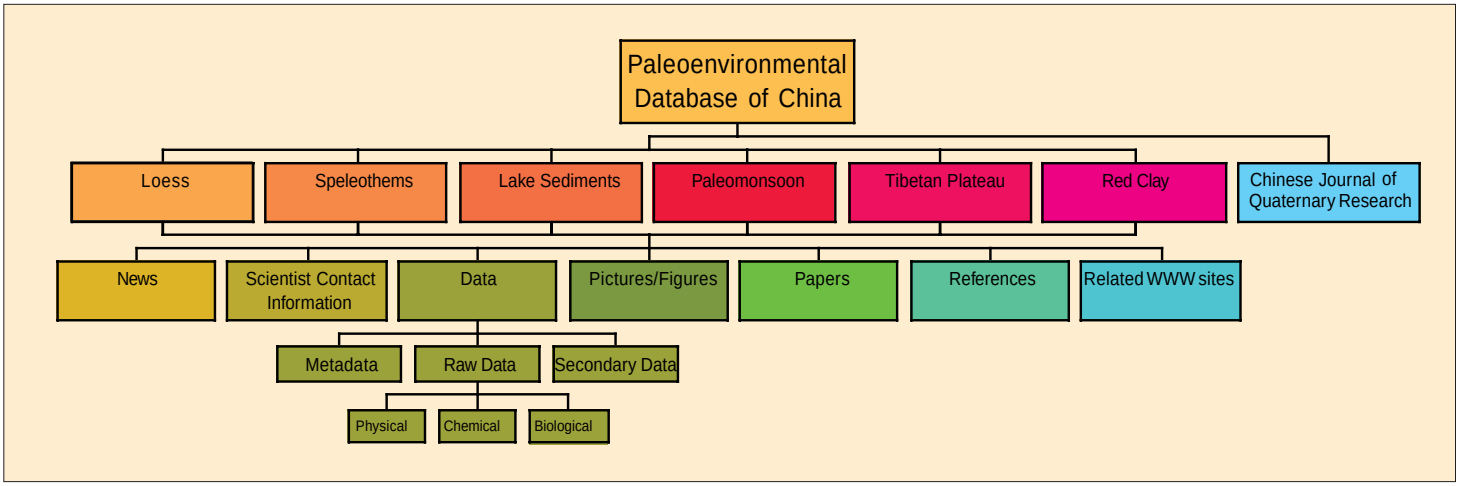
CD-ROM available with
J. Geophys. Res. Atmosphere-Oceans special edition, Nov. 30, 1997

Project web sites:
http://www.esf.org/lp/lp_013a.htm and *http://arcss.colorado.edu/gispgrip*

The data sets can also be found at:
http://www.ngdc.noaa.gov/paleo/icecore/icecore2.html and *http://medias.meteo.fr/paleo/icecore/greenland/summit/index.html*

The Paleoenvironmental Database of China (PDC)



Schematic outline of the structure of the Paleoenvironmental Database of China (PDC)

The Paleoenvironmental Database of China (PDC) has been established at the Institute of Geology, Chinese Academy of Sciences. The database is financially supported by the National Natural Scientific Foundation of China (NNSFC) and the Chinese Academy of Sciences (CAS). Its scientific objectives are to create a management system for paleoenvironmental and modern climatic data, to develop analytical methods for quantitative and qualitative study of the dynamical and statistical characteristics of paleoclimate, and to make these data readily available to the international scientific research community.

The database consists of three parts:

1. The Modern Environmental Database contains monthly mean temperature and precipitation throughout China as well as other modern climatic data. The database also provides some secondary data such as the efficient index of temperature or precipitation, the continental degree of temperature, the possible evaporation and the humidity index.

2. The Paleoenvironmental Database mainly manages climatic and environmental information derived from loess, lake and stalagmite archives, as well as information on past sea level, desert extent, and paleo-vegetation. The information includes original data, secondary data, images and figures. Physical, chemical and geological properties of loess and speleothems currently make up the bulk of the data in the database. In order to provide boundary conditions for general circulation model (GCM) simulations, paleoenvironmental reconstructions of China for several time slices are also contained in the database. The paleodata of the PDC come from two important sources: Chinese research programs and other published papers.

3. The Analysis Software consists of numerous programs that can be used to quantitatively analyze various characteristics of environmental change. The mathematical methods fall into the following categories: (1) time scale transfer (from depth to time) (2) power spectrum analysis (including moving power analysis) (3) transfer functions to convert from proxy indices to climatic parameters (4) response surface analysis (trend surface analysis) (5) fractal dimension analysis (6) time series analysis (7) the BP neural network for predicting future climatic change (8) laminae analysis software for extracting information of microlayers in speleothems.

Website Under Construction

Construction of an internet accessible version of PDC began shortly after the PAGES second workshop on global paleoenvironmental data, held in February, 1998. The structure of the database required minor modification based on the requirements of the internet. At present, it contains sections on loess, speleothems, tree rings, lake sediments (especially maar lakes), paleomonsoons, red clay and the Tibetan plateau, as well as the Chinese Journal of Quaternary Research. Within each of these individual topics can be found research news, data, pictures and figures, contact information for relevant Chinese scientists, papers published by Chinese scientists, a list of references and relevant internet links. On the homepages of the Chinese Journal Quaternary Research, the title and abstract of every paper are also provided in English. The database on the internet is displayed in two languages, Chinese and English. All data in the database are coded so as to be compatible with formats used in the World Data Center (WDC-A).

Although the storage of data and meta-data as described above has begun, and new information is being archived continuously, the database can not yet be publicly accessed because of some remaining difficulties which include limited financial support, assignment of an official domain name for the WWW-site, an incomplete meta-data section acknowledging the data producers and other technical problems.

As we are making great efforts to solve these problems, internet access to the PDC will be available in the near future. In the coming years, we expect more data will be put into the internet database of PDC together with analysis software. Users will be able to retrieve both the information they require as well as analysis methods to study these paleodata.

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What's New at the World Data Center for Paleoclimatology

Internet Use Sets Record

More and more people are checking out the paleo information available from the WDC. While the amount of data retrieved leveled off in the summer of 1998 at around 2000 MB/month, the total number of users per month continues to climb, and surpassed 15,000 users/month in August 1998.

Milestones in Temporal Resolution

The vision of a global set of proxy measurements with high, in some cases annual resolution is getting closer, and the increasing emphasis on annually resolved records is evident in several data sets received in the past year. The Mann *et al.* (1998) reconstructions of average Northern Hemisphere temperatures for every year since 1400 provides a synthesis data set that include year by year global maps of temperature over the last 250 years generated using modern spatially-correlated patterns to reconstruct the globe using the sparse paleo grid. Briffa *et al.* (1998) reconstructions of Northern Hemisphere growing season temperatures for the period A.D. 1400-1994 document recent increased summer warmth and examine the link between temperature and volcanic forcing. The wonderful GRIP and GISP ice core data are now available via the Internet and as a CD. The compilation of these data represents an enormous effort on the part of individual scientists and groups of scientists, and makes possible other exciting studies, such as that by Blunier, *et al.* (1998). Blunier *et al.* provide an improved correlation between Greenland and Antarctic ice cores that now makes it possible to evaluate the timing of millennial scale events and other abrupt changes between the Northern and Southern Hemispheres. Each of these data sets are highlighted under the "What's New" section of the WDC web site, and the data are available over the Internet. Of course, these data are only a small fraction of the data received in 1998, and many more important and exciting new data sets covering different time scales, and different climate and environmental processes can be found at the WDC *(www.ngdc.noaa.gov/paleo/paleo.html)*.

The map on the cover of this newsletter was produced using the software *PaleoVu*, which is available together with the data from the WDC–A Website at *http://www.ngdc.noaa.gov/paleo/softlib.html*

Spotlight on Data Useful to a Broad Audience

Data produced by PAGES scientists are often needed by the larger, interdisciplinary audience outside of the paleo community, and the WDC attempts to make highly specialized published paleo data accessible to this audience as well. Examples of the broad audience include scientists from other IGBP core projects, climatologists, oceanographers, environmentalists and earth scientists. To make paleo data accessible to this broader audience, we have begun to spotlight certain data sets on our web site with a "What's New" section. Each spotlight contains, in addition to the data sets, an abstract, some explanatory material, figures, sometimes a few photographs, plus links to the other web-based information about the data. Using "What's New" makes it easier for our interdisciplinary colleagues to keep up with the fast pace of research in paleoclimatology today *(www.ngdc.noaa.gov/paleo/whatsnew.html)*.

Data Organized by Scientific Discipline

In its role as the long-term archive and data coordination point for PAGES tasks and activities, the WDC handles an incredibly diverse array of paleoenvironmental data. To make these data easier to find, the WDC has re-organized its web site access by discipline. Data access via FTP has always been organized by discipline, and of course, scientific journals are mostly discipline-oriented, so the web site organization is a logical one for scientists. New discipline categories include climate forcing and ice cores (containing the rapidly expanding ice core data inventory). In addition to discipline-specific data access, the discipline web pages also feature other information about projects and scientific initiatives, and links to related sites. One of the advantages of the web is that one can present multiple pathways for a user, and one can also choose a multidisciplinary pathway to find a data set. Next time you browse the WDC site, you might try using the general search page *(www.ngdc.noaa.gov/paleo/ftp-search.html)* or the discipline searches for paleocean, pollen and tree-ring data, and climate model output. Alternatively, one can search by contributor name.

Some Things Never Change

Some things at a World Data Center never change, like the ongoing commitment to the safe and effective data archive, and successful data distribution to scientists around the world. The WDC's in Boulder (Paleoclimatology, Marine Geology and Geophysics, Solar and Terrestrial Physics, Solid Earth Geophysics) have upgraded their computer system to a speedier, more fault tolerant co-server configuration (two SUN Ultra Enterprise 2 workstations, each with 108 GB disk storage, and a 6 MB/sec fractional T3 Internet connection). We still have the painfully restricted bandwidth crossing the Atlantic, and continue to cope by making web pages and data file sizes small, and by using a mirror site *(medias.meteo.fr/www/anglais/activites/donnees/)*. Taped backups, migration to new media, and offsite storage all remain a cornerstone of the WDC commitment to the long-term archiving of data. Hard disk and magnetic tapes do not last forever, and data are continuously migrated to new media both for protection against degradation, and also to take advantage of technological advances.

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References:

Blunier, T. et al., 1998. Asynchrony of Antarctic and Greenland Climate Change During the Last Glacial Period. *Nature*, 394: 739-743.

Briffa, K.R., Jones, P.D., Schweingruber, F.R. and Osborn, T.J., 1998. Influence of Volcanic Eruptions on Northern Hemisphere Summer Temperature Over the Past 600 Years. *Nature*, 393: 450-455.

Mann, M.E., Bradley, R.S. and Hughes, M.K., 1998. Global-scale temperature patterns and climate forcing over the past six centuries. *Nature*, 392: 779-787.

The IMAGES Database

The objectives of IMAGES (International Marine Global Changes Study) are to quantify climate and chemical variability of the ocean on time scales of oceanic and cryospheric processes; to determine their sensitivity to identified internal and external forcing, and to determine the oceans' role in controlling atmospheric CO_2 (Pisias *et al.*, IMAGES Science and Implementation plan, PAGES workshop report 94-3). To reach that objective, data acquisition and synthesis are major priorities, including coordination of international coring cruises. Four cruises have been completed on the *Marion DuFresne:*

- IMAGES I, MD101; North Atlantic Ocean and Norwegian Sea, 1995.
- IMAGES II, NAUSICAA; Namibia Angola upwelling system and Indian/Atlantic connection, 1996.
- IMAGES III, IPHIS I &II; south of Australia and south-north transect from New Zealand to China Sea, 1997.
- IMAGES IV; Indonesian Archipelago, western Pacific and East China Sea, 1998.

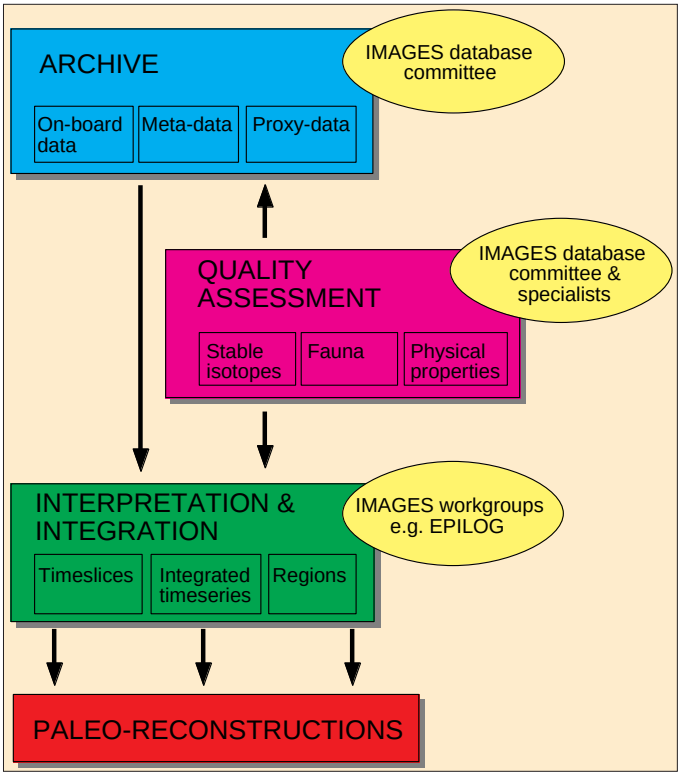
The 1999 IMAGES V cruise is planned to retrieve annual to centennial resolution cores along a N–S transect in the western and eastern parts of the North Atlantic, and the Greenland/Norwegian Seas. IMAGES data are, however, not only data collected during IMAGES supported *Marion DuFresne* cruises. The goals will only be reached if we also use high quality marine paleoproxy data from other research programmes consistent with IMAGES philosophy and goals.

The goals demand also that the collected data are archived and data exchange is made possible from the first to the last phase of research. Finally, the ultimate results should be freely accessible for the entire scientific community. Therefore IMAGES decided to form a committee responsible for data management, consisting of Sacha De Rijk (chair), Dave Anderson (World Data Center advisor) and Frank Rack (physical properties advisor). The IMAGES database will be designed and compiled in close co-operation with the World Data Center at Boulder, USA *(http://www.ngdc.noaa.gov)* and existing database efforts from various laboratories and agencies (e.g. the German PANGAEA information system, *http://www.pangaea.de)*.

One of the major features of the IMAGES database will be the introduction of data quality assessment. The archiving and interpretation/integration of data are the two other components of the database (see figure). Data will be archived using protocols already established for other PAGES tasks and activities, and distributed freely over the Internet *(http://www.images.cnrs-gif.fr).*

Quality assessment is key to the success of the project, as IMAGES' aim is to gather high quality and high resolution data. With the help of specialists we will formulate a set of criteria to be applied to each data set. Criteria for stable isotopes, for example, will include details on calibration, number of specimens analysed, and preparation methods used. A quality index can then be attached to each data set in the IMAGES database. In other words, no data set will be excluded *a priori* from the subsequent interpretation and integration stage.

Interpretation and integration of the proxy data will be performed by various workgroups focusing on specific timeslices, methods or regions. One such workgroup (EPILOG) has already begun to re-evaluate the Last Glacial Maximum, allowing integration of paleodata into numerical climate modelling experiments (e.g. PMIP project). Additional reconstructions will be similarly derived from major IMAGES working groups (e.g. SEAMONS; Asian monsoon variability).



Schematic outline of the structure of the planned IMAGES database

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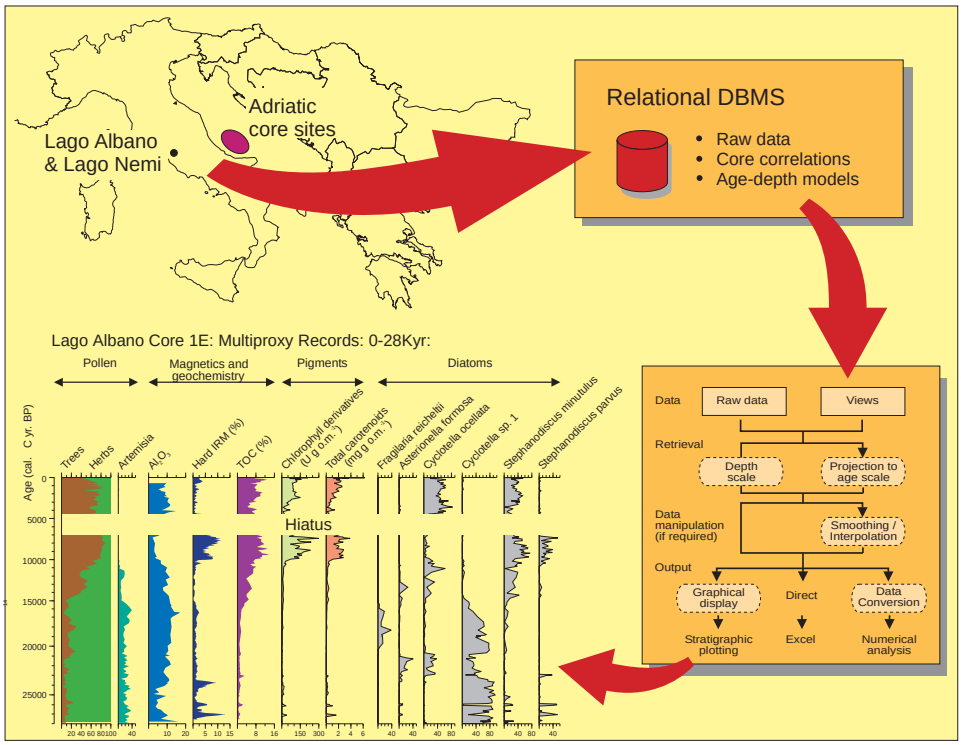
The joint PAGES/SCOR marine program IMAGES (International Marine Global Change Study) provides travel grants for young scientists from developing countries to attend major IMAGES related scientific meetings. Scientists interested in learning more about the IMAGES program, or applying for travel funding, should contact either their national IMAGES representative or the IMAGES secretariat. Further information, including a list of member nations and national representatives, can be found on the web at *http://www.images.cnrs-gif.fr.*

A PEP III Multi-Proxy Database for Managing and Analyzing Paleoenvironmental Data



Schematic outline of the PALICLAS database

The Pole-Equator-Pole (PEP) projects are inherently multi-site and multi-proxy, requiring the integration and analysis of different paleoenvironmental indicators recorded from regional or continent-wide site networks. Consequently, there is a need to develop an effective data management strategy that allows information from different sources to be integrated, harmonized and retrieved in a consistent format. This article describes a recent attempt to construct a multi-proxy database within the PALICLAS project, and outlines plans for its development as an integrated, scalable system for managing project data within the PEP III transect.

The PALICLAS project focused on the analysis of Italian crater lake and Adriatic sediments, with the aims to provide improved high-resolution proxy paleoclimate records for central Italy for the last 20k+ years, and to characterize the responses of both terrestrial and aquatic ecosystems during periods of rapid climatic change. Central to these aims was the need to make direct comparisons between the different biological, chemical and physical proxy records recorded in marine and lacustrine sediments. To accomplish this we constructed a PC-based data management system consisting of a relational database to store all raw data from the project, and a series of software tools for data manipulation, visualization and analysis.

The essential features of the system are illustrated in the figure. All physical, chemical and biological information is uniquely referenced to a core and depth interval, and records may be retrieved as raw data (e.g. microfossil counts) or transformed values (e.g. percentage data) using saved queries or views. These data may be retrieved on the original depth scale, or, for between-core comparisons, transformed to the depth scale of a "master" core or to an age scale, using core-correlation and age-depth models held in the database. The resulting single- or multi-proxy records may then be output directly, plotted using built-in visualization software, or smoothed and/or interpolated in preparation for further numerical analysis.

The PALICLAS database was primarily developed as a tool for the rapid comparison and cross-correlation of different proxies within and between sites. However, as the project developed the database performed a number of other important roles. In particular, the system has facilitated:

1. quality control, ensuring consistency and compatibility among data produced by different laboratories;

2. data sharing, by providing a means of rapidly distributing datasets to all participants as the project developed;

3. basic data manipulation, such as age-depth modelling and core correlation, harmonization of microfossil data recorded at different taxonomic resolutions, and calibration of the various proxy records;

4. data exploration and hypothesis generation, by allowing rapid visualization of multiple proxies on various age or depth scales;

5. hypothesis testing, by preparing the data for numerical analyses to test the significance of observed relationships; and

6. the creation of a long-term archive for all project data.

Our experience in PALICLAS has convinced us that paleoenvironmental databases should be seen not as a repository for data once a project is completed and published, but as an essential tool for data management and analysis as the project develops. In dealing with multiple proxies, from multiple sites, generated by different laboratories, PALICLAS offers a microcosm for PEP III data management. As such, we are now expanding the database structure to handle additional proxy records. Our ultimate aim is to produce an integrated database and data visualization / analysis system that can be distributed freely to laboratories and used to manage data within individual PEP III projects. By adopting a common database structure that is scalable across platforms, it is also intended that the system can be used to integrate data from these different projects as the need arises. To that end, we are collaborating closely with colleagues at the World Data Center in Boulder, to ensure compatibility with the global databases being developed there.

Further details about the PALICLAS project, including a more detailed description of the database can be found in the Memorie dell'Istituto Italiano di Idrobiologia, Vol. 55, 1996 (Eds. Guilizzoni and Oldfield), 357 pp, or on-line at *http://www.iii.to.cnr.it*. Details of the developing PEP III data management system can be found on the PEP III web site at *http://www.geog.ucl.ac.uk/ecrc/pep3.htm*.

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PKDB - the International Paleoclimate Database

The International Paleoclimate Database (PKDB) is part of the research program "Terrestrial Paleoclimatology" of the German Federal Government. Both, the database and the program, are headed by Prof. Dr. Dr. h.c. B. Frenzel.

PKDB is a multi-proxy database dedicated to the storage of climatological and ecological data of the whole earth for the Quaternary and part of the Tertiary. Developing a comprehensive database for all the very heterogeneous data sources that have to be taken into consideration is the great scientific and technological challenge for PKDB.

Focal points of our work are:

1. Extraction of relevant data from literature
2. Longtime archiving of data produced by the projects of the "Terrestrial Paleoclimatology" and other similar programs
3. Integration of public data from related data centers
4. **Critical analysis** of the stored data
5. The reconstruction of the global climate and ecology for the Quaternary
6. Maintenance of the archive with up-to-date data
7. Free and convenient access to the holdings of the database
8. Compatibility with other paleodata efforts such as the WDC-A in Boulder, and in Germany with CERA and PANGAEA

This work is at the moment done by five scientists at the Botanical Institute of the Hohenheim University, Stuttgart.

Structure and Contents of the Database

The database is based on a relational database system (EMPRESS) and is composed of:

- a large bibliographic table (> 300,000 references)
- data tables: META-data (> 70,000) with corresponding tables for header data, tabular data, datings, soil data
- climate data tables for present-day and reconstructed values (spot and grid data)

Additional tables exists for taxonomy, excerpts and abstracts, site descriptions, stratigraphic correlations, images, climate indicators etc.

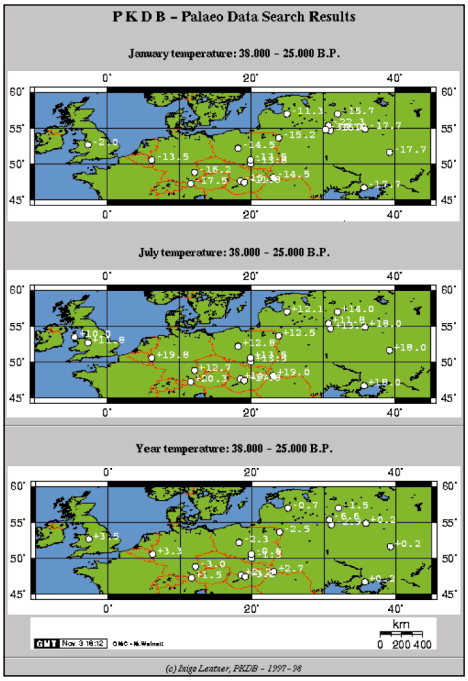
Both, original data and data added by the critical analysis, are stored and their origin is clearly indicated. All data can be updated, when, for example, progress in dating technology is made.

WWW-Interface

Public access to the holdings of PKDB started with a 4GL-Interface for VT220-terminals and X-Windows. From August 1997 on we began to offer access to the PKDB tables by a publicly available WWW interface.

The data holdings can be accessed from two query forms:

The first form is for a bibliographical query through the tables for bibliography, excerpts and abstracts. The results can be obtained as a table or as a reference list (figure below). Any available data associated with a given reference is indicated by the presence of a data icon. The data itself is then accessible by clicking on this icon.



Climate reconstruction maps produced with the web-interface from a data query

The second form is for a query through the data tables, with the possibility of restricting the query by data group, coordinates, altitude or time period. The result is shown in a overview table, from which the detailed data sets can be accessed with a further click. The geographical distribution of the data is shown on a variety of maps.

The next release of this query program, which is now in a test phase, will allow additional qualifications on data queries, different output formats, and even queries for tables and maps of taxonomic distribution and some climate reconstruction time slices (figure above). Ideas for further improvements are numerous.

Outlook

Negotiations are under way for the long-range safeguard of the database under the auspices of the German "Program of Academies". This will allow us to accomplish our goals, not only to be an archive for paleoclimatic data, but also to maintain the contents of the database up-to-date as the science progresses.

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records 25 – 36 of 47 – previous 12 records | next 11 records – bibliography as reference list

	No.	Authors	Title	Year	Data
	13197	Adam, K. D.	Quartärforschung am Staatlichen Museum für Naturkunde in Stuttgart.	1966	
	14306	Adam, K. D.	Der Affenmensch von Java.	1967	
	14307	Adam, K. D.	Eiszeitliche Säugetierfunde aus der Charlottenhöhle bei Hürben.	1968	
	11856	Adam, K. D.	Urmensch – Museum Steinheim an der Murr.	1969	
	14308	Adam, K. D.	Zur Großgliederung der Altsteinzeit Europas.	1969	
	10112	Adam, K. D.	Die "Artefakte des Homo steinheimensis" als Belege urgeschichtlichen Irrens.	1974	
	10117	Adam, K. D.	Die mittelpleistozäne Säugetier – Fauna aus dem Heppenloch bei Gutenberg (Württemberg).	1975	
	14309	Adam, K. D.	Das Steinheimer Becken – ein Denkmal aus der Erd– und Lebensgeschichte unserer Heimat.	1976	
	14312	Adam, K. D.	Der Mensch im Eiszeitalter.	1982	
	11320	Adam, K. D.	Das Vorkommen des Buchsbaumes in den Cannstatter Sauerwasserkalken – Ein Beitrag zur Kenntnis der mittelpleistozänen Flora Südwestdeutschlands.	1985	
	11322	Adam, K. D.	Der vermeintliche Fossilbeleg eines Urmenschen aus mittelpleistozänem Travertin von Stuttgart – Bad Cannstatt.	1986	
	11323	Adam, K. D.	Die Höhlenruine von Hunas in der Fränkischen Alb – Reflexionen zum Forschungsstand.	1986	

Click on the yellow dot to get the detailed record !
Data set available over the yellow dot!

Reference table produced with the web-interface from a bibliographic query

Joint PAGES-LOICZ Initiative on Late Holocene Sea-Level and Climate Change

The Research Context

Regional sea level changes over the last few thousand years have been principally determined by small eustatic contributions from fluctuations in global ice volume, steric contributions due to thermal and/or saline expansion of seawater, fluctuations in ocean circulation and continuing post-glacial geodynamic adjustments to the ocean basins. Interpretation of these sea level changes at coastal sites is often complicated by vertical movements of the land through tectonic and sedimentary processes.

Several international projects have developed programs to study the rates and causes of modern sea level changes, including the Int. Oceanographic Commission (IOC) Group of Experts on the Global Sea level Observing System (GLOSS) and Global Ocean Observing System (GOOS), the Permanent Service for Mean Sea level (PSMSL) and the World Climate Research Program Climate Variability and Predictability Program (WCRP-CLIVAR). However, there has been little focus on the effect of century to millennial scale climatic fluctuations on late Holocene sea level, ocean circulation and regional patterns in ocean salinity and density. This topic has to a large extent been overshadowed by research on the geodynamic influence on relative sea level history since the mid Holocene. Great effort has gone into numerically modelling predictions of future sea level rise (Warrick *et al.*, 1995) but little has been focused on hindcasting the last millennial sea level history. Recent research by van de Plassche *et al.* (1998) and Nunn (1998) have demonstrated that regional sea level in the north eastern USA and parts of the south western Pacific Ocean have experienced fluctuations on the order of a few decimeters over a few hundred years, which are synchronous with observed sea surface temperature (SST) and proxy temperature oscillations. These sea level fluctuations are on the order of the observed globally averaged 0.15 to 0.25 cm rise in sea level for this century.

Evidence for climatic fluctuations during the last few thousand years is increasing for each of the PAGES PEP transects. This evidence includes proxy SST from deep sea sediments, coral time series, fluctuations in sea ice cover and biogenic and terrestrial sedimentation in polar shelf sediments as well as proxy atmospheric surface temperature and rainfall records from mangrove, coastal swamp and lake sediments, fluvial sedimentation patterns, coral reef growth rates, ice core stratigraphy and tree rings.

A Joint Initiative

Recently, both the PAGES and LOICZ SSC's have approved the establishment of an initiative to focus on the contribution of climate change to late Holocene (last 1000–3000 years) global sea level fluctuations using proxy climate and ocean data and relative sea level records. The first task of the initiative will be to determine the influence of late Holocene climate and oceanic circulation changes on sea level in the Oceania region of the Pacific and the tropical Indian Ocean as well as the centennial to millennial rates of regional sea level change. The small islands and atolls which are scattered throughout these regions are some of the most vulnerable to modern and predicted sea level rise. Modern sea level monitoring programs on low atolls and islands in the south Pacific and in the Maldives, in the Indian Ocean would also benefit considerably from a greater coverage of detailed relative sea level curves determined for the last 1000–3000 years.

Scientist Involvement

The project will require the involvement of climatologists and oceanographers with both modern and paleo specializations, coastal geologists and geomorphologists, and ocean and geodynamic modelers. Participation is sought from research scientists working in the Oceania and tropical Indian Ocean regions together with global experts. Collaboration with scientists associated with PAGES ARTS and PEP II, LOICZ, WOCE/CLIVAR, START Oceania, and IGCP 367 (Late Quaternary Coastal Records of Rapid Change) and its succeeding project, will also be sought. As the initiative develops it is planned that collaboration with scientists working on glacio-eustatic contributions to Late Holocene sea level will be encouraged.

It is planned to convene a PAGES/LOICZ sponsored workshop on "Late Holocene climate and rates of sea level change in Oceania and the tropical Indian Ocean" in early to mid 1999. Scientists interested in participating in and/or in the development of the initiative should contact Ian Goodwin (coordinates below), Nick Harvey, Vice Chair LOICZ SSC, The University of Adelaide, Adelaide 5005, Australia, nharvey@arts.adelaide.edu. au, or Keith Alverson at the PAGES IPO.

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(references listed on bottom of next page)

Spain: Paleoclimatology of the Last 18,000 Years

A new three-year project funded by the Spanish government is investigating paleoclimatology of the last 18,000 years. It is mainly based on pollen analysis of continental and sub-littoral deposits from Mediterranean Spain, but other proxies such as geomorphology, paleobotany, paleontology and dendroclimatology are being considered. The project involves the following Spanish universities: Murcia, Autónoma de Barcelona, Valencia, Alcalá, Sevilla, León, Autónoma de Madrid and Politécnica de Madrid. The project embraces two sub-projects led respectively by José S. Carrión (Murcia) and Joan M. Roure (Barcelona) and both coordinated by the former. Among the main goals of this project are not only to increase the scanty paleoecological database but also to improve collaborative research, increase international links, and acquire financial support for more ambitious actions in the future.

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PAGES–CLIVAR Intersection

Climate variability on seasonal to century scales has inherent societal implications and importance. Climate predictability on these scales is potentially of enormous economic value. In part for these reasons, the World Climate Research Program (WCRP) has prepared a science plan for a fifteen year research program, Climate Variability and Predictability (CLIVAR). CLIVAR's task is to study climate variability and predictability and the response of the climate system to anthropogenic forcing. This task cannot be accomplished without paleodata. Although not all of PAGES data are directly relevant to the CLIVAR program, there is a substantial amount of paleoclimate data, available at annual or higher resolution, which extends the historical climate record well beyond the instrumental period and provides valuable information about past episodes of abrupt climate change. In addition, paleoclimate problems provide an excellent test for climate system models. The PAGES–CLIVAR working group, jointly established by PAGES and CLIVAR serves specifically to bring members of the modern and paleo climate dynamics communities together to formulate and promote the use of paleoclimatic information for meeting CLIVAR goals.

As this newsletter issue went to press the CLIVAR program had scheduled its inaugural public meeting for national representatives at the UNESCO center in Paris, December 2–4. The PAGES–CLIVAR intersection will be represented there with two posters, an oral presentation by Jean Jouzel, as well as the presence of several members of the PAGES scientific steering committee in attendance. In support of this new joint initiative a website has been established *(http://www.pagesclivar.unibe.ch)*. Members of the PAGES community interested in playing a role in the development of the PAGES–CLIVAR initiative are encouraged to keep abreast of developments using this website. Additional comments or requests for more detailed information should be sent to Keith Alverson.

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PEP III News

PEP III now has a scientific steering group that met recently in Gent, Belgium, to discuss strategy for the next three years. The committee includes Rick Battarbee and Francoise Gasse (joint coordinators), Keith Briffa, Stein-Erik Lauritzen, Fekri Hassan, Frank Sirocko, Eric Odada, Louis Scott, Frank Oldfield and Catherine Stickley. Catherine is a full-time administrator based in the Environmental Change Research Centre at University College London, and we hope with her help to make rapid progress in implementing PEP III plans.

With such a large number of countries involved, one of Catherine's first jobs is to help set up a network of national PEP III representatives. Their principal role will be to keep the PEP III office aware of national research developments and at the same time help to spread the PAGES/PEP III gospel.

We now have a PEP III web page and hope this will develop into the main vehicle of communication for all PEP III activities. A key task will be to set out the full PEP III implementation plan. Although this may well take some time, we hope an outline plan will be ready by the time this newsletter appears. We would like to encourage as much feedback as possible on the plan as to continue to modify and update it.

The next step will be to take advantage of the INQUA congress in Durban, South Africa, next summer to publicize PEP III and illustrate PEP III scientific themes. We expect to have our own poster session and a dedicated workshop. For the poster session there will be a sequence of generic thematic posters (e.g. on causes of climate change, climate impacts on society, multi-proxy archives) as well as individual project-based posters. We would like to take this opportunity to encourage everyone whose work falls within the PEP III remit to present a poster in this session. For the workshop session we hope to focus specifically on climate change and its effects in Africa, with the discussion being led by Francoise Gasse, Fekri Hassan, Dirk Verschuren, Louis Scott and others.

Looking to the future, we plan to hold a major open meeting sometime in the year 2001 to summarize and synthesize progress in our understanding of PEP III climate change problems. The date and venue has not yet been agreed but as soon as we have news about this or any other PEP III matter we will post it on the new web page.

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PEP III Website
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Reconstructing the Isotopic Composition of Past Precipitation from Continental Archives

ISOMAP Workshop, Vienna, Austria, August 24–26, 1998

The distribution of stable isotopes in precipitation provides crucial quantitative information about the global water cycle. Increasing use of the water isotope tracers ^{18}O and ^{2}H in the atmospheric general circulation models that mimic Earth's climate processes has especially highlighted the need for better documentation and understanding of the distribution of isotopes in both past and present precipitation.

Thirty-two participants gathered in Vienna for the first ISOMAP workshop, held in cooperation with the Isotope Hydrology Section of the International Atomic Energy Agency, at IAEA headquarters in Vienna. ISOMAP is the central element of PAGES Focus 5 on Isotope Calibration (Activity 2, Task 1), and the primary goal of this inaugural workshop was to enunciate the transfer functions linking the isotopic data recorded in a given continental archive to the precipitation from which it was originally derived. This is an essential step in efforts to compile and manage isotopic data for data-model comparison, in order to clearly define the potential to estimate or constrain the isotopic composition of paleoprecipitation.

The discussions began by reviewing existing knowledge about the distribution of isotopes in modern precipitation, gained in large part from the IAEA/WMO Global Network for Isotopes in Precipitation (GNIP). This long-running program was recently strengthened by the signing of a Memorandum of Understanding between the two agencies, including establishment of formal PAGES representation on the Scientific Steering Committee. Although originally intended only to define what were thought to be essentially stationary input functions for hydrologic studies, the GNIP data base has proven to be a key source of information about contemporary global climate dynamics and change. Other related activities, especially the new science initiative ISOHYC (Isotopes in the Hydrologic Cycle) will build on the GNIP foundation to forge more sophisticated understanding of isotope-climate linkages.

The state of understanding about the fundamental physical processes controlling the natural isotopic labeling of water in the hydrologic cycle was also addressed, and the introductory session ended with a call for careful re-appraisal of such fundamental considerations as the kinetic behavior of deuterated water molecules during evaporation under various conditions, which remains surprisingly ill-defined.

ISOMAP Working Groups

The remainder of the workshop was devoted to plenary presentations by five previously established proto-working groups and subsequent break-out sessions. The first presentation dealt with the current abilities of general circulation models to depict the distribution of isotopes in global precipitation at different times, including the present. In spite of the relatively coarse (but continually improving) spatial resolution of current model runs, it is clear that the major features of the distribution of isotopes globally can be reproduced with some fidelity. The situation for the past is less clear, in significant part because of the sparse paleo-isotope data that are readily available.

The other four working group presentations focused on the major types of continental isotopic archives, including glacier ice, groundwater and speleothems, lake sediments, and terrestrial organic archives. For some archives, such as glacier ice and groundwater, the link to the original precipitation is very direct, and can potentially provide both $\delta^{18}O$ and $\delta^{2}H$ values, as well as the *d*-excess parameter ($d = \delta^{2}H - 8\,\delta^{18}O$), whereas other archives, including carbonate lake sediments, for example, may only support estimation of precipitation $\delta^{18}O$ indirectly via isotopic transfer functions linking both the archive to the lake water and the lake water to local precipitation.

Climate modelers are currently looking to paleoscientists for data of two types, the more familiar **time-slice** reconstructions of the isotopic composition of paleoprecipitation, for validation of equilibrium climate scenarios for key times in the past, including past extremes (e.g. Last Glacial Maximum and 6 ky BP), as well as a growing interest in **time-interval** reconstructions, to examine features of transient climate variability over selected periods. The former approach requires absolute constraints to be placed on estimates of the isotopic composition of paleoprecipitation for a given time and place, akin to estimates of paleotemperature or other climate parameters derived from different proxies. A prominent question addressed by modelers has been the robustness of spatial and temporal isotope-temperature relations in the past, because of their importance in the calibration of isotope paleothermometers. In contrast to such point-in-time isotopic reconstructions, validation of model-generated estimates of past climate variability, currently focused on the last millennium, depends on sub-decadally resolved paleo-isotope time-series, generally limited to archives like tree-rings and annually laminated lake sediments.

Paleo-Isotope Data

The presentations and discussions demonstrated that a high level of sophistication already exists in the development of transfer functions between measured parameters and precipitation, as a result of the extensive use of water isotope tracers in paleo-environmental investigations, but a major challenge facing both producers and users of paleo-isotope data is the effective management of data and meta-data, to permit ready retrieval of raw and inferred data for comparison and reinterpretation. This will be an important goal of future ISOMAP activities. Though the workshop was not focused on the problems of data compilation, the critical need for more paleodata from low latitudes was clearly recognized. Paradoxically, low-latitude glaciers, which constitute one of the best sources of paleo-isotope data in regions such as the Andes and Himalayas, are particularly poorly represented by (or even invisible to) current GCM's.

The primary outcome of this workshop will be a collection of peer-reviewed articles to appear in *Quaternary Science Reviews*, documenting the current state-of-the-art of continental isotope paleoclimatology, from the viewpoints of both paleodata production and use.

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Searching for Missing Ice Sheets on the Tibetan Plateau

Xining, China, July 21–24, 1998

During the International Symposium on the Qinghai-Tibet Plateau, there were lively discussions on the issue of the possible extent of former ice cover over the Tibetan Plateau. Liu Tungsheng and a number of participants presented several lines of evidence arguing that there might have been a significant quantity of ice on the Tibetan Plateau in past glacial periods, including the Last Glacial Maximum (LGM). Liu's view was based on the climatic implications of the loess-soil sequence in the areas of loess cover adjacent to the Tibetan Plateau, as well as some ice-related morphological and sedimentological features. Some evidence of erratics was also reported by Dr. Jarkel from Germany. Moreover the output of a modified Hold–ridge Biome Model, from Prof. Zhang Xinshi, indicates that the temperature on the Plateau during the LGM was 5-9 °C lower than for the present-day, therefore favorable to the development of large ice-sheets. In addition, over the last few years, an increasing number of studies have suggested that the lake levels in western China during marine oxygen isotope stage 3 were exceptionally high and that a huge lake may have existed adjacent to the Tibetan plateau region. If this was the case, the presence of these extensive water bodies would be most readily explained by the effects of ice-melt from the surrounding mountains, since the corresponding paleosol in the same region is rather weak, suggesting that precipitation alone would have been unable to provide enough water for huge lakes.

Irrespective of the final outcome of the debate, the Tibetan ice-sheet issue deserves to attract serious attention since the surface conditions of the plateau would have had a major impact on glacial climate over a wide area and potentially even on a global scale, through modulating the latent heat and albedo as well as through any physical effects on atmospheric circulation.

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Atlantic Transect of the European Lakes Drilling Program (AT–ELDP)

London, UK, April 21,1998

Brief reports on work in progress were presented by members of the group. A detailed discussion followed, during which it was agreed that the basis of the Atlantic Transect will be as follows:

1.The strategy adopted will be to try to develop detailed comparison between the modern instrumental record (the last 150–200 years), and the most recent part of the sedimentary record. A multiproxy approach will be used in order to test whether regional climate changes identified in the instrumental record are also replicated in the sediments. A calibration/ transfer-function approach will then be adopted, in order to extend the record of climate variability back into the past. It was recognized that there may, however, be a limit to the period over which modern processes amenable to calibration in this way are representative of past changes. The standard ELDP strategy, of using only high resolution (< 20 year) multisite, multi-proxy, multi core lake sediment sequences, preferably annually laminated, will also be followed.

2. The ultimate aim of the AT–ELDP will be to generate data on the effects of climate/ environmental change on human society, in this case along the Atlantic Seaboard of Europe, over the past 2 ka. The effects of changes in and over the North Atlantic Ocean will be compared with the instrumental and multiproxy sediment record, in order to try to identify what their influences were on contemporary human societies.

After the discussion of general principles, a number of more detailed points were raised:

3. The project as outlined above clearly needs the input and support of climatic historians. AT–ELDP should therefore seek, at the earliest opportunity, to enlist the support of as many colleagues with such expertise as possible.

4. The events and changes in and over the North Atlantic Ocean with which the group are concerned operate on several different timescales, from circulation and formation of NADW to annual variations in weather. However, over the past five years, phenomena such as changes in the position of the north wall of the Gulf Stream (NWGS), and in the index of the North Atlantic Oscillation (NAO), have come to the fore as proposed generators of mesoscale (submillennial, centennial, decadal) changes, especially as there is some indication that they may also be linked to solar variability.

5. In response to the question of whether signals reflecting these types of variability may be detectable, various colleagues indicated where and how they believe they have identified NAO-type influences upon the sedimentary record. In some lakes, however, the anthropogenic record may be so strong as to overprint the climatic signal. Inter-site comparisons of high resolution records (e.g. Loch Ness, N Scotland to Lough Neagh, N Ireland) could be used to evaluate this complication.

6. It was recognized that in any attempt to identify the human implications of climate variability in the past, the contrasted paradigms within the social and environmental sciences may present major problems.

7. The problems involved in correlating effectively between the sedimentary and the instrumental record are non-trivial. They include questions of dating and temporal resolution, and the required representativity and continuity of sedimentary records; in recent decades, there is also an "economic over-ride" of natural processes. Given sufficiently high resolution, calibration of records to the instrumental record was nevertheless considered achievable.

8. Members of AT–ELDP include colleagues from Iceland (Rekyavik), UK (Belfast and Plymouth), Ireland (UCD), and Spain (CSIC, Barcelona). AT–ELDP would welcome participation from new members from other European countries on the Atlantic seaboard, as well as cooperation from any historians who might be interested in such a project.

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EU Advanced Study Course: Holocene Climate Reconstuction

London, UK, June 15–25, 1998

Expert Lectures

Forcing mechanisms and climate simulations in the Holcene
Paul Valdes (Reading University) Jonathon Overpeck (National Geophysical Data Center)

Instrumental and documentary records
Phil Jones (University of East Anglia) Roy Thompson (University of Edinburgh) Peter Brimblecombe (University of East Anglia)

Chronologies and temporal time scales
Mike Baillie, (Queens University, Belfast) Valerie Hall (Queens University, Belfast) Jonathan Pilcher (Queens University, Belfast) Ingemar Renberg (Umea University)

Proxy archives used in Holocene climate reconstructions
Keith Barber (Southampton University) Julie Cole (University of Colorado) Sheri Fritz (LeHigh University) Stein-Erik Lauritzen (University of Bergen) Mark Maslin (University College London) John Matthews (University of Wales) David Peel (British Antarctic Survey)

Proxy methods and climate reconstruction
John Birks (University of Bergen) Steve Brooks (Natural History Museum) Sheri Fritz (LeHigh University) Joel Guiot (University of Marseilles) Jonathan Holmes (Kingston University) Phil Jones (University of East Anglia) Andy Lotter (University of Bern)

Appplications of Holocene climate research in PEP III
Keith Bennett (Cambridge University) Atte Korhola (Helsinki University) Henry Lamb (Aberystwyth University) Frank Sirocko (University of Kiel) Tony Stevenson (Newcastle University) Lucia Wick (University of Bern)

Human society and climate history in PEP III
Fekri Hassan (University College London) Steve Shennan (University College London) Paul Sinclair (University of Uppsala)

Holocene climate research in other regions: PEP I, PEP II, CAPE and Antarctica
John Dodson (Perth University) Viv Jones (University College London) Glen Macdonald (University of Colorado) Vera Markgraf (University of Colorado)

The Environmental Change Research Centre, University College London, hosted an eleven day Advanced Study Course entitled "Holocene Climate Reconstruction", earlier this year from June 15th to 25th. The course was funded by the European Union, and 30 European PhD and Masters candidates, selected by a scientific panel, were invited to attend with all accommodation and food paid.

Classes were designed to follow closely the scientific agenda set out by the IGBP Past Global Changes (PAGES) program, and the Executive Director of PAGES, Prof. Frank Oldfield, gave the opening paper. The course was designed to strengthen the European science base in paleoclimatic research well into the next century, and consisted of a series of lectures, followed by discussions and computer-based practicals. The course thus provided a unique forum for young European scientists to hear some 36 international experts give in depth overviews of their research field, and discuss the latest research findings and state of the art techniques (see "Expert Lectures").

The students prepared posters which were displayed throughout the meeting, and they also presented short papers (20 minutes) on their research to the rest of the group. The overall quality of the posters and presentations was outstanding, with many at a level comparable with international meetings. Three poster and three presentation winners were however, selected on the basis of quality of presentation, clarity, scientific input and stage of career (see "Winners").

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Full references for the reports and papers published in this newsletter can be obtained from the respective authors

Winners

Posters

Anna Agusti-Panadera
(Edinburgh University, UK)
Reconstructing 200 years of climate change at remote alpine lakes in Europe

Sonja Hausmann
(University of Berne, Switzerland)
High-resolution study of the last centuries in the laminated sediments of subalpine Seebergsee (Switzerland)

Christin Jensen
(Tromso University, Norway)
Reconstructions of Holocene forest-line displacements and climate in North-Norway

Presentations

Bodo Bookhagen
(Potsdam University, Germany)
Water balance model of a landslide dammed lake in the Andes of NW Argentina (26°S, 66°W)

Graziella Bozzano
(Barcelona University, Spain)
A case study of paleoclimate variability deduced from the marine sedimentary records

Jorijntje Hendericks
(ETH-Zentrum, Switzerland)
Holocene coccolith assemblages and morphology in the eastern boundary current system (NW Africa)

PAGES
PAST GLOBAL CHANGES

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Tephrochronologie et Co-existence Hommes-Volcans

Brives-Charensac, France, August 24–29, 1988)

A wide-ranging interdisciplinary meeting entitled "Tephrochronologie et Co-existence Hommes-Volcans" took place in the Haute-Loire, south-central France, with support and sponsorship from PAGES, the INQUA Commission on Tephrochronology and Volcanism, and UNESCO. This meeting joined geologists, volcanologists, tephrochronologists, palynologists, paleoclimatologists, and archeologists to discuss connections and relationships between volcanic eruptions, environmental and climate change, and archeological records of human response to volcanic events. Prof. Etienne Juvigne, a tephrochronologist from the Université de Liége and Prof. J. Raynal, an archeologist from the Université de Bordeaux, jointly organized the conference.

Participants at the meeting came from many countries in Europe, as well as North America, Asia, Africa, and New Zealand. PAGES support allowed scientists from former eastern-block countries to attend this meeting, including Dr. Vera Ponomereva, a noted volcanologist and tephrochronologist from Kamchatka, Dr. Oksana Savoskul, a geologist from the University of Moscow now residing in Ghana, Africa, who uses tephrochronology to date geologic records of climate change, and Dr. Alicia Stach-Czerniak, a palynologist and paleoclimatologist from the Institute for Quaternary Research in Poznan, Poland.

Highlights of the meeting came in sessions which made sometimes surprising interdisciplinary connections between aspects of tephrochronology, palynology, ice core records, climate and environmental change, and archeology. Prof. Rewi Newnham (University of Plymouth) and Prof. David Lowe (University of Waikato) gave an important talk concerning tephrochronologic dating and the geologic and palynologic evidence of a Younger Dryas climate signal in New Zealand. Prof. Takaaki Fukuoka presented new data on tephras discovered in the Japanese Mizujo Station ice core in Antarctica, and their possible source and age. Dr. Ponomereva suggested that during times of intense volcanism in Kamchatka the environment was strongly affected, and human colonization was inhibited while Dr. Begét presented evidence of very similar volcanic constraints on the human occupation of Alaska during the Holocene. Prof. Juvigne showed that tephra layers can be used to precisely calibrate the timing of paleoclimatic events across wide areas, raising questions about the recognition of local vs. global environmental forcing in palynologic records. Prof. John Hunt (University of Cheltenham) presented a provocative model suggesting global climate and glacier fluctuations control volcanic eruption frequencies. Important talks were also given on new developments in geochronology by Prof. Edward Rhodes of Oxford and Prof. John Westgate of the University of Toronto. Dr. Jerome Lecointre talked about volcanic processes at recent eruptions in New Zealand (and also was a tireless scientific translator).

The meeting included visits to interesting geologic and archeologic sites in the Haute Loire, including the museum at Chilhac, where volcaniclastic deposits contain a diverse upper Pliocene fossil assemblage, and associated, controversial, possibly human artifacts. A post-conference field trip visited numerous volcanic localities in the French Massif Central.

At the end of the meeting a visit was made to the PAGES distillery in Le Puy, where a curious green liqueur is produced in enormous copper-clad vats connected by dripping tubes. Although there is no known connection between IGBP-PAGES and the PAGES distillery, samples were forwarded to the PAGES office in Bern just to be sure.

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PEP II Meeting

Fremantle, Australia, July 1–3

Australia hosted its first PEP II Workshop meeting over three days in the depths of a mediterranean-type winter. Two days were devoted to talks and discussions on PEP II science themes and one day was spent on biomisation of Australia and nearby tropical regional pollen data sets.

The talk fest, Day 1 and Day 3 of the meeting, attracted 23 oral papers and an audience of about 50 people attended the presentations. The meeting began with a series of reviews of the big picture climate change science questions for PEP II, including the links between PEP II questions and the those for other PEP transects (Dodson, Liu, Markgraf, Ono, Brooke). Cocklin covered the significance of climate change for human societies in the Pacific region. Harvey summarized the state of knowledge of palaeosea-level investigations in southern Australia while Heijnis, Harle, Magee, Hesse, Soons and Shulmeister presented recent and ongoing work on long climate change records from a range of environments in Australia and New Zealand, and what they tell us from the perspective of at least one glacial cycle. Taylor, Pickett, Boyd (two papers) and Suparan presented analyses of climate changes based on recent work on Late Pleistocene and Holocene records from northern and southern Western Australia, New Britain, Thailand and Indonesia while Colhoun and Haberle applied records from Tasmania and the tropics to raise and review questions about glacial refugia and fire history. The last group of presentations concentrated on high resolution data series from tree-rings, corals and lake sediments (Barbetti, Cook, Mooney, Hantoro).

The second day of the meeting was held in the Department of Geography at the University of Western Australia and was devoted to the BIOME 6000 project. Eighteen people spent the day discussing biomisation of pollen data from the Australia-Indonesia-New Guinea and Western Pacific Islands region. Participants were not allowed to go until a first pass at defining viable Plant Functional Types (PFTs) and biomes, based on the collective knowledge of pollen repre-

continued on next page

The Southeast Asian Dendro Workshop 1998 (SEA Dendro 98)

Chiang Mai, Thailand, February 16-20, 1998

Coring old-growth Pinus merkusii *from Thung Salaeng Luang National Park in north-central Thailand (Photo: M. Barbetti)*

PEP II, continued from previous page

sentation for the region, had been agreed. The outcome was 30 proposed PFT's and 23 biomes. These were compared to the established Biome 6000 biomes. Dr. Liz Pickett was able to present these at the BIOME 6000 meeting in Jena, Germany, October 1998, along with the modern and fossil assembled data series as part of the region's overall contribution to the BIOME 6000 project.

The 3 days were clearly productive and many participants were involved in a PAGES project for the first time. The lively discussion brought home the value of this kind of comparative exercise in allowing a refining of interpretations of climatic change data from a substantial body of existing and growing proxy-data across the region. There are now many new data series coming online from South East Asia [see for example the following report by D'Arrigo], and these are particularly welcome as they fill a large gap identified from the earliest days in setting up the PEP II program. The meeting was also seen as an important link to other groups such as the Southern Connections, Australasian Quaternary Association and the Institute of Australian Geographers. The meeting was generously supported by PAGES and the University of Western Australia.

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The principal goal of this conference was to foster communication, collaboration and exchange of information and ideas among scientists actively involved or interested in the development and analysis of tree-ring and other paleorecords for paleoclimatic studies in Southeast Asia and the vicinity. Such data are very sparse for vast areas of this region of the Pole-Equator-Pole (PEP) II transect, for both PAGES time streams I and II. There is thus a critical need to expand the existing database for Southeast Asia and adjacent sites. Tree-ring records were the main emphasis of the meeting, although other paleoclimatic and historical data were discussed. The meeting brought together some 50 scientists from 15 nations, many of whom had not had the opportunity to attend an international conference in the past. Both oral communications and posters were presented. The meeting succeeded in summarizing the state of the art for dendrochronology in Southeast Asia and vicinity and in identifying key scientific questions and needs for successful future research efforts in the region, including efforts to reconstruct large-scale climatic change. It was thus highly successful in advancing the interests of PAGES/PEP II as well as ESH, ARTS, CLIVAR, START and other initiatives. Below is an overview of the meeting.

Introductory Presentations

The governor of Chiang Mai opened the meeting with a Buddhist ceremony. Several introductory presentations provided an overview of the climate of Southeast Asia based on instrumental data, including Asian monsoon and ENSO variability and ENSO–monsoon interactions in the Southeast Asian region. A state of the art review of tropical dendrochronology set the stage for the tree-ring papers. Another keynote presentation discussed the ecophysiology and forest dynamics of tropical forest trees in Thailand and elsewhere in Southeast Asia.

Southeast Asia

A series of presentations highlighted recent tree-ring studies in Thailand, focusing on the development of teak and mountain pine tree-ring chronologies and their links to monsoon climate and historical data. Other Thailand work presented included radiocarbon variations in mountain pine tree-ring records and discussion of forest physiology, ecology and stand dynamics modeling, and human disturbance. Papers were also given on the development of teak records in Indonesia and their use in paleo-ENSO studies, including reconstructions of the Southern Oscillation Index (SOI). Another paper reported on the development of density tree-ring records from Laos.

North and East Asia

Several papers outlined recent tree-ring studies in northern and eastern Asia. For Mongolia, presentations were given on the use of tree-ring data to reconstruct temperature and precipitation (drought). The climatic response of tree growth to monsoon rainfall, snowfall, winter temperature and other factors was identified in tree-ring data from South Korea, China, Japan, and Taiwan.

Western Asia

Studies were also presented from Western Asia, including the high elevation areas of Tibet, Nepal and India. For Tibet, there was discussion of the potential for use of tree rings from drought-sensitive trees for reconstruction of monsoon activity; for Nepal, the development of chronologies, growth patterns and links to monsoon climate were discussed, for India there was discussion of teak and other tree-ring records and their response to monsoon precipitation.

Other Tropical Regions

There were also presentations on tree-ring studies in tropical regions outside of Asia: in Brazil x-ray identification of growth ring features in Araucaria, and in Zimbabwe identification of suitable tree species for dendrochronology.

Recommendations for Future Work

Future collaborative efforts between dendrochronologists from Asia and western nations need to include the establishment of tree-ring laboratories in Asia (as has already been initiated in Nepal, Thailand and Mongolia), coordinated field expeditions, and the writing of combined proposals and papers. Memoranda of Under-

standing (MOUs) can be very useful in facilitating field efforts, as has been demonstrated in Nepal, Mongolia, and other Asian sites.

Some of the largest gaps in coverage of tree-ring and other high resolution paleoclimatic data are found in the tropics. Sites where there is pronounced seasonality, and suitable tree species with annual rings and sufficient longevity thus need to be identified. Basic strategies for successful development of tropical tree-ring chronologies were discussed. Emphasized was the importance of accurate cross-dating, which is critical for establishment of annual ring structure and to ensure precise dating of difficult tropical species. Relatively few tree species have been identified which are suitable for dendrochronology in the tropics. One key strategy mentioned is the value of targeting those species which are closely related to others successfully shown to cross-date elsewhere in the tropics or at higher latitudes (e.g. coniferous species). Trees which are deciduous, with ring porous to semi-ring porous wood anatomy, are often the most promising (e.g. teak and related species). Large diameter cores, log sections, and achievement of large sample size can facilitate tropical tree-ring efforts for suitable species.

There is a need to integrate tropical tree-ring work with related research on low latitude forests, including studies and modeling of ecology, phenology (including dendrometer measurements), forest dynamics, forest resources, and documentation of any anthropogenic effects. These studies can considerably aid interpretation of the tropical tree-ring efforts and vice-versa. It is useful to separate two foci: true tropical dendrochronology (i.e. equatorial to near-equatorial sites) in Southeast Asia and elsewhere as opposed to dendrochronology at high elevations in Asia (e.g. Tibet), the latter being more comparable to temperate studies. There is a slower rate of progress in the tropical efforts, requiring extra encouragement. It is important to note that more temperate sites can also yield information on tropical climate features, for example the demonstrated ENSO signal in tree-ring data from the western USA. Other parameters, in addition to ring width, hold promise for gleaning the maximum possible forest growth and climate information from tropical trees. Those highlighted at the meeting include stable isotopes, maximum latewood density and other intra-ring width and density parameters, vessel area and other anatomical features, and electron probe and chemical analyses.

Reconstructed pre-monsoon (March-April-May) climate of Shimla (Western Himalaya, India) using Picea smithiana *tree-ring chronologies (smooth lines indicate low-frequency variations)*

Tropical dendrochronologists should increase the awareness of the potential usefulness of tree-ring data for climatic studies, and collaborate with climatologists to determine how best to exploit the available instrumental climatic data. In addition to correlation and regression analysis of tree-ring and climate data, comparison of tree growth and climate extremes can yield useful information. Efforts should be made to compile local literature on relevant botanical and forest-related knowledge, and to compare the tree-ring data to historical and other proxy records available for the region of interest. Such comparisons can aid in cross-validation and eventual multi-proxy climatic reconstructions. The tree-ring data should be submitted to the wider dendrochronological and climate community through the International Tree-Ring Data Bank (ITRDB). There is also a need to compile/assemble a database of proxy, historical and instrumental data for Asia for dissemination to interested scientists.

The papers resulting from the meeting will be published in a journal which will be announced. As a follow-up to the meeting, a small dendroecological fieldweek is planned for local students and scientists in Thailand within the coming year.

This meeting was supported by PAGES and by the Climate Dynamics Division of the United States National Science Foundation.

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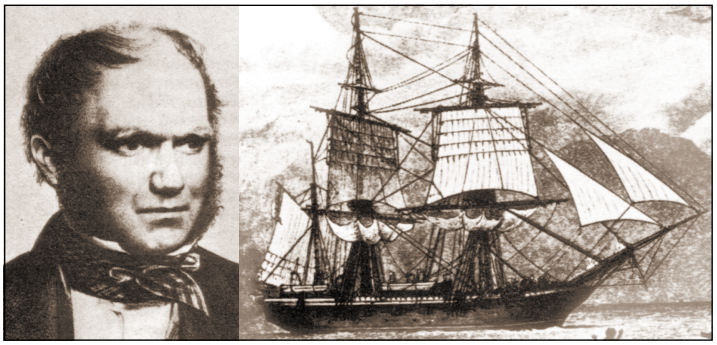
Darwin on Dust at Sea



In their interesting contribution "The Chinese loess plateau - far and wide" (PAGES Newsletter 98–1) Biscaye and Grousset state that the record of modern eolian dust transport beyond the borders of continental deserts has been known for decades, at least since Radczewski 1939. They could have cited also Darwin who in 1833, a hundred years before Radczewski's report, mentioned "atmospheric dust" off the Cape Verde Islands on board of the *HMS Beagle* "dirtying everything on board and even hurting people's eyes" (see his Journal of Researches, 1845, chapter 1).

Darwin was well aware that this dust originated from Africa. However, Ehrenberg (1844, 1845 *Monatsber. Berlin Ak. Wiss.*), studying Darwin's and other dust samples collected at sea, found remains of siliceous skeletons of diatoms and phytoliths of plants, some of which he knew only from S. America. Darwin in his later "account of the fine dust which often falls on vessels in the Atlantic Ocean" (*Quart. J. Geol. Soc.* London, 1846) refers again to his observation on the *Beagle* as well as to many scattered accounts concerning dust which had fallen on ships on the African side of the Atlantic Ocean. Darwin concludes an African origin, because of the increase of dust towards the African coast and the wind direction, dismissing Ehrenberg's finding of some S. American diatoms. Maury (1855) in his well known "Physical Geography of the Sea" devotes part of his chapter 4 (6 in later editions) to dust at sea, the so called "red fogs" probably well known to sailors even long before Darwin. He tries to explain the presence of S. American diatoms in the dust observed by Ehrenberg as due to a transport from the Amazon and Orinoco basins in higher layers of the atmosphere. Maury also refers to a description of a wind-spout in the dry season in Orinoco basin observed by Alexander von Humboldt and described in his "Ansichten der Natur" (1807) to explain how dust particles can be transferred to high in the atmosphere.

In 1849 Darwin again mentioned aerial dust in his contribution on Geology in Herschel's "Manual of scientific Enquiry". He urged travelers to collect the dust falling on ships in the middle of the Atlantic, and make notes on day and location, indicating also the direction and force of the wind on the day itself and the previous days. Darwin was very interested in the provenance of this dust, a topic which remains an active research topic in our times.

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Picture credits
Down House Archive *(HMS Beagle)*, Drawing by T. Magire (Darwin)

PAGES CALENDAR

(* indicates open meetings. All interested scientists are invited to attend)

- **January 26–28, 1999 "Marine Environment, the Past, Present and Future". Kaohsiung, Taiwan**
  Contact: Chen-Tung Arthur Chen, Institute of Marine Geology and Chemistry, National Sun Yat-Sen University, Kaohsiung, Taiwan.
  Tel: +886-7-525 5146, Fax: +886-7-525 5346
  ctchen@cc.nsysu.edu.tw

- ***February 13–18, 1999 "Glacial-Interglacial Sealevel Changes in Four Dimensions: Quaternary Sealevel, Climate Change and Crustal Dynamics". Albufeira, Portugal**
  Contact: Dr. Josip Hendekovic, European Science Foundation,
  1 quai Lezay-Marnésia, 67080 Strasbourg, France.
  Tel: +33 3 88 76 71 35, Fax: +33 3 88 36 69 87
  euresco@esf.org; *http://www.esf.org/euresco/Lc99087a.htm*

- ***March 15–19, 1999 "International workshop on sediment transport and storage in coastal sea-ocean system". Tsukuba, Japan**
  Contact: Yoshiki Saito, Marine Geology Department, Geological Survey of Japan, Higashi 1-1-3, Tsukuba, Ibaraki 305-8567, Japan.
  Fax. +81-298-54-3533, Phone +81-298-54-3772
  yoshi@gsj.go.jp

- ***March 26–April 1, 1999 "Loessfest 99 – Loess: Characterization, Stratigraphy, Climate and Societal Significance". Bonn and Heidelberg, Germany**
  Contact: Ludwig Zoeller, Geogr. Inst., University of Bonn, Meckenheimer Allee 166, D-53115 Bonn, Germany. Phone: +49-228-735398
  zoeller@slide.giub.uni-bonn.de; *http://www.gg.rhbnc.ac.uk/loessfest*

- ***March 28–April 1, 1999 "European Union of Geosiences meeting (EUG 10)". Strasbourg, France**
  Contact: By indvidual symposia, see website below
  http://eost.u-strasbg.fr/EUG/symposia.html

- **May 6–14, 1999 "IGBP Congress (with PAGES Scientific Steering Committee Meeting)". Yokahama, Japan**
  IGBP Contact: IGBP Secretariat, Royal Swedish Academy of Sciences, Lilla Frescativägen 4, Box 50005, S-104 05 Stockholm, Sweden
  Tel: +46 8 16 64 48, Fax: +46 8 16 64 05; sec@igbp.kva.se
  PAGES Contact: Frank Oldfield, PAGES IPO, Bärenplatz 2, 3011 Bern, Switzerland. Tel: +41 31 312 31 33, Fax: +41 31 312 31 68
  oldfield@pages.unibe.ch; *http://www.pages.unibe.ch*

- **May 21–27, 1999 "Palaeoclimate Modelling and Analysis: Quaternary Earth System Interactions and Modelling". Albufeira, Portugal**
  Contact: Dr. Josip Hendekovic, European Science Foundation
  coordinates see above (February)

- ***August 3-11, 1999, "The Environmental Background to Hominid Evolution in Africa - INQUA XV International Congress". Durban, South Africa**
  Contact: Dr D.M. Avery - Secretary General, South African Museum, P.O. Box 61, Cape Town 8000, South Africa.
  Tel: +27-21-243330, Fax: +27-21-2467
  mavery@samuseum.ac.za; *http://INQUA.geoscience.org.za*

- **September 17–22, 1999, "Polar Regions and Quaternary Climate: Towards High-Resolution Records of the Last Glacial Period in Antarctica". Giens, France**
  Contact: Dr. Josip Hendekovic, European Science Foundation
  coordinates see above (February)