ISOTOPIC COMPOSITION OF PAST PRECIPITATION

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 the 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.

The first PAGES/IAEA ISOMAP workshop was held at the IAEA Headquarters in Vienna, 24-26 August 1998, which gathered thirty-two participants. 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 particular 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 paleo-precipitation.

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 two agencies, including establishment of formal PAGES representation on the GNIP Scientific Steering Committee. Although originally intended only to define what were thought to be essentially stationary input functions for hydrologic studies, the GNIP database 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 remainder of the workshop was devoted to plenary presentations by five previously established 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.

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 paleo-data 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 GCMs (general circulation models).

Further information can be obtained from: ***Thomas W. D. Edwards,*** *project co-ordinator,* Department of Earth Sciences, University of Waterloo, Waterloo ON N2L 3G1 CANADA.
e-mail: twdedwar@uwaterloo.ca

Notes on the Front Cover Photo

Pasterze glacier (~2360 m. a.s.l.) in southwestern Austria is the largest glacier in the Eastern Alps (19.7 km^2 in 1969). The external ice stretches all the way for about 10 km from the Grossglockner (Big Clock) (3,798 m.a.s.l.), Austria's highest mountain, seen in the background of the photo.

In the past, the ice extended much farther and reached much higher levels of the slopes on both sides of the valley, but in the last a few decades, it has receded remarkably, as evidenced by glacier formations, probably due to recent climate changes.