

# **International Partnerships in Ice Core Sciences (IPICS) Update for US NSF and US Scientific Community**

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## Introduction and History

IPICS is an affiliation of scientists from 20 nations, organized to plan the next generation of science based on ice cores in the polar and other regions. The overall goal is to further develop the role of ice core science in improving our understanding of natural and human forced variations in the global earth system. IPICS is an outgrowth of discussions at the "Future of US Ice Coring" workshop held at NSF in March 2002. At that meeting the concept of broader international collaboration to achieve major scientific goals was raised, and received positively by US scientists and international colleagues in attendance. The first IPICS organizational meeting was held in Virginia, in March 2004. A second meeting was held in Brussels, in October 2005. Meeting reports and other information are available at the IPICS web site at <http://www.pages.unibe.ch/science/initiatives/ipics/>. IPICS is also an approved IPY Project (Project 117).

IPICS outlined four major international projects, which are described further in white papers available at: <http://www.pages.unibe.ch/science/initiatives/ipics/whitepapers.html>.

In brief, these are:

1. **The oldest ice core:** A 1.5 million year record of climate and greenhouse gases from Antarctica (a time period where Earth's climate shifted from 40,000 year to 100,000 year cycles).
2. **The last interglacial and beyond:** A northwest Greenland deep ice core drilling project (a deep ice core in Greenland recovering an intact record of the last interglacial period).
3. **The IPICS 40,000 year network:** A bipolar record of climate forcing and response.
4. **The IPICS 2k Array:** A network of ice core climate and climate forcing records for the last two millennia.

A fifth, and critical, element of IPICS is the development of advanced ice core drilling technology. A technical white paper entitled "**Ice Core Drilling Technical Challenges**" addresses this and is also available on the web site.

## Steering Committee

The IPICS steering committee is chaired by Ed Brook (Oregon State University) and Eric Wolff (British Antarctic Survey). There are currently 29 steering committee members, with representation from 20 nations (SC members are listed on the IPICS web pages). Most committee members represent national research interests, but some also represent special expertise relative to IPICS goals.

### Project Status and Planning Documents

Of the four scientific projects the second, “The last interglacial and beyond,” is the furthest along, in the form of the NEEM ice core project in Greenland, led by the Niels Bohr Institute at the University of Copenhagen. NEEM drilling is planned to start in summer 2008, and take approximately three years. US NSF is funding significant logistics support and a limited amount of science at the University of Kansas and University of Colorado. A multi-PI proposal to support US research on gas records and abrupt climate change in NEEM is in review, as are several science proposals from other groups.

A draft science and implementation plan is now available for the “Oldest Ice Core” project, and can be downloaded from the IPICS web site. This project is probably the most unique and potentially transformative of the IPICS goals, as it would essentially double the length of the climate and greenhouse gas record currently available from ice cores. Extensive geophysical survey work in East Antarctica is needed for site selection. IPY GAMBIT (Robin Bell, Columbia Univ. and collaborators) is funded to do relevant geophysical work in the Gamburtsev Mountains region. The ICECAP Project (Don Blankenship, UT, and collaborators) will do relevant survey work in other regions of east Antarctica. Funding the US component of ICECAP is apparently pending at this writing. Both of these survey projects are critical steps for the oldest ice goal for IPICS.

The remaining two formal IPICS project science plans are still being written. The plan for the 40,000 year-network is being finalized and a draft will be released shortly. However, the concept of an IPICS 40,000 year-network has influenced planning in several nations. Projects that will contribute to the network are underway or recently completed (including the WAIS Divide Core and European projects at Berkner Island, Talus Dome, and Drønning Maud Land in Antarctica, and the NEEM project in Greenland). US investigators have also proposed drilling a 40,000-year core on Roosevelt Island in the Ross Sea (H. Conway, U. Washington, in review).

### Affiliations with International Organizations

IPICS is affiliated with PAGES (Past Global Changes) and the PAGES program office supports the IPICS web site. IPICS is not a formal PAGES project, but PAGES support has been integral to maintaining momentum. IPICS is also affiliated with SCAR (Scientific Committee on Antarctic Research). The current affiliation with SCAR is somewhat loose, but the IPICS Steering Committee was approached by the SCAR Executive Director (Colin Summerhayes at BAS) about forming an IPICS SCAR expert group. I believe this will happen. IPICS will most likely also be affiliated with IACS (International Association of Cryospheric Sciences), a new Association within IGBP. PAGES, SCAR, and IACS can offer modest financial support for meetings (for example travel costs for a limited number of meeting participants) and help with meeting organization and web support. IPICS does not have an affiliation with IASC (International Arctic Science Committee), but this has been discussed.

### Recent and Future Planning Meetings

An informal meeting of European scientists interested in IPICS was held in October 2007. There is considerable interest in IPICS in Europe, particularly in leading aspects of deep drilling for oldest ice. A meeting of US investigators interested in IPICS will be held at the Fall AGU meeting (Monday Dec. 10 at 6:30 PM in the San Francisco Marriott Hotel; contact Mark Twickler ([mark.twickler@unh.edu](mailto:mark.twickler@unh.edu)) for details).

A formal meeting of the IPICS Steering Committee will be held following the EGU meeting in Vienna in April 2008. Dates are April 19 and 20, 2008.

### Considerations for the Future

In my view IPICS has been very successful in providing an international framework for ice core research. For example, the NEEM project has a large number of international partners – not just in Europe, but also including the US, New Zealand, Australia, and others. More generally an IPICS “community” is developing, which is fostering more international collaboration.

It seems likely that some of the work that IPICS proposes can be conducted by collaborating groups of scientists working within existing funding and logistics structures. For example, the “40,000 year network” project requires a number of ice cores, any one of which can be collected and analyzed by one or a few collaborating nations. An umbrella structure that makes decisions about site locations, common analyses, data synthesis, and interactions with other elements of the scientific community is required. IPICS can provide this.

The “oldest ice” project may be an exception. The goal there is challenging, though we think reachable. Several deep ice cores may be needed in quite remote locations, which may require collaboration and sharing of resources beyond that of the other projects. The scientific payoff is potentially very high, creating great interest, and the challenge will be to obtain the resources needed, and balance contributions with credit for the work and access to samples. The draft science plan outlines options for sharing resources and credit. A specific consideration may be how drilling is organized. For example, two to three cores might be drilled at promising places by teams led by different nations or national groups. On the other hand, a consortium might be formed that would oversee all of the drilling. Issues like this will need to be considered further as IPICS continues to develop.