

European Partnerships in Ice Core Sciences

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International Partnerships in Ice Core Sciences

IPICS

<http://www.pages-igbp.org/ipics>

Co-chairs: Eric Wolff (BAS) and Ed Brook (OSU)

Australia, Austria, Belgium, Brazil, Canada, China, Denmark,
Estonia, France, Germany, India, Italy, Japan, Korea,
Netherlands, New Zealand, Norway, Russia, Sweden,
Switzerland, United Kingdom, United States



International Partnerships in Ice Coring Sciences (IPICS) and the IPICS-IPY Initiative

- Ice coring scientific objectives are increasingly complex
 - More cores to see spatial patterns
 - Deeper and older cores, in more difficult places
- International cooperation can help meet these goals



EPICA, NEEM,



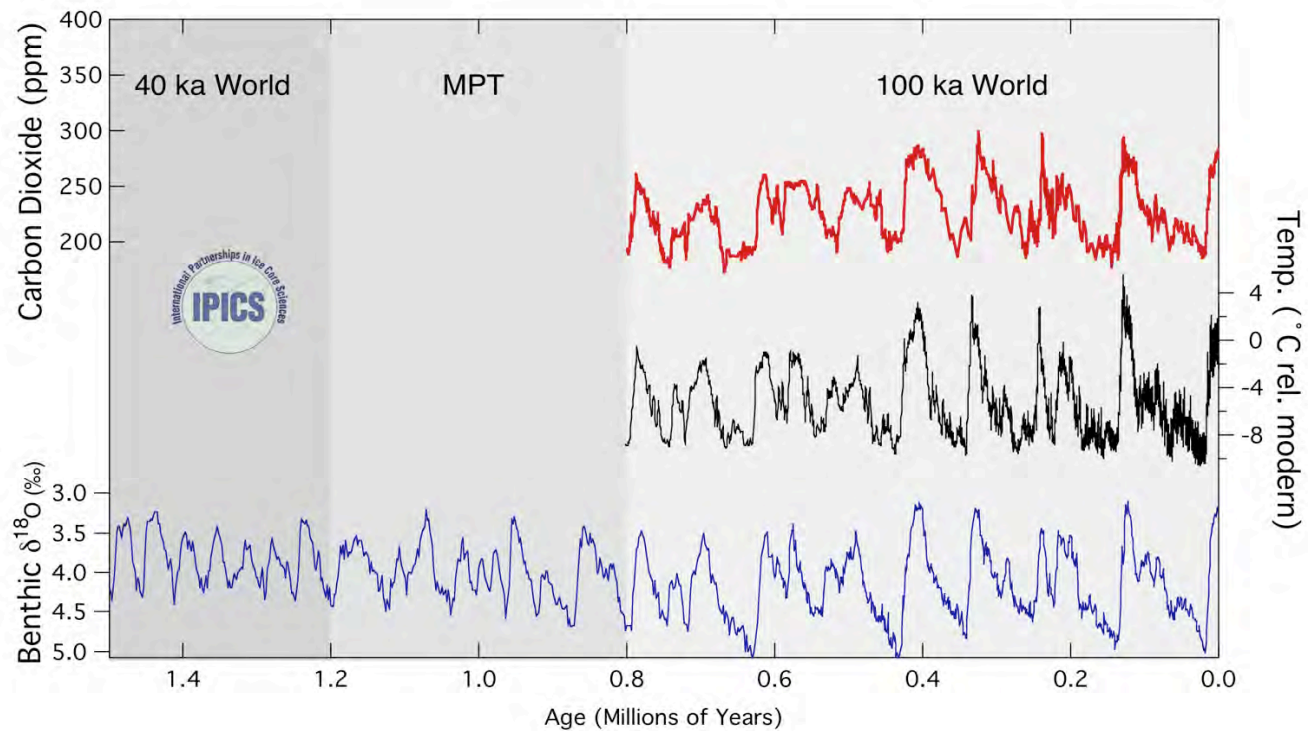
The IPICS Projects

- **The oldest ice core**: A 1.5 million year record of climate and greenhouse gases from Antarctica.
- **The IPICS 40,000 year network**: a bipolar record of climate forcing and response.
- **The IPICS 2kyr array**: a network of ice core climate and climate forcing records for the last two millennia.
- **The last interglacial and beyond**: A northwest Greenland deep ice core drilling project (NEEM).
- **A technical wing**



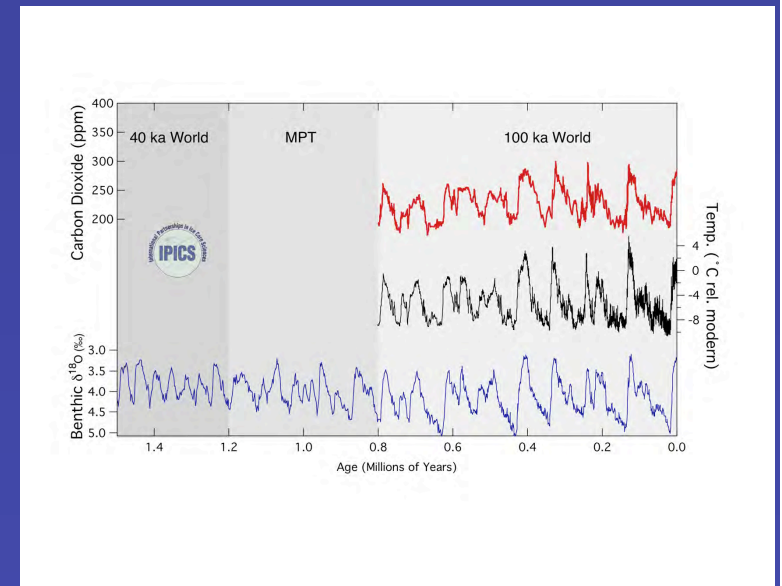
The oldest ice core

Mid-Pleistocene transition



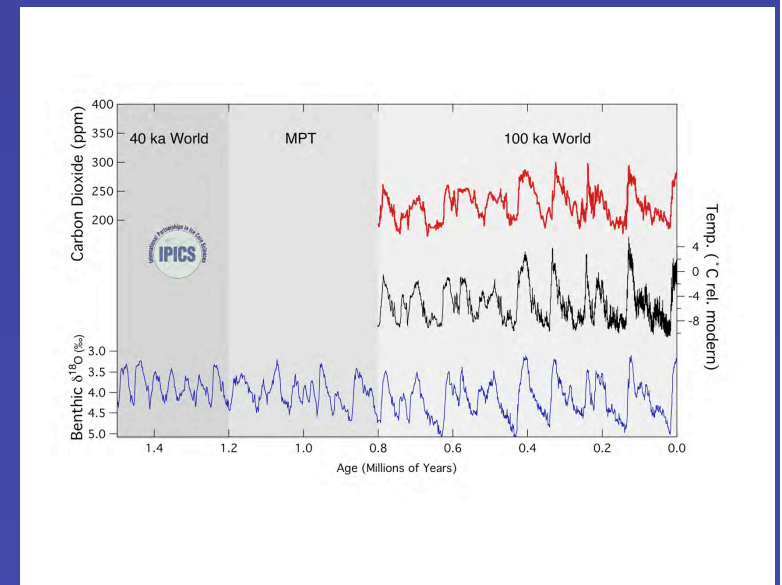
Underlying science issues

- Unless we understand the transition from 40 ka cycles to 100 ka cycles, we don't really understand current climate
- Why did we have the Mid-Pleistocene Transition (MPT) around 1 Ma ago?
- Why do we now live in a 100 ka world?



An ice core reaching the 40 ka world would

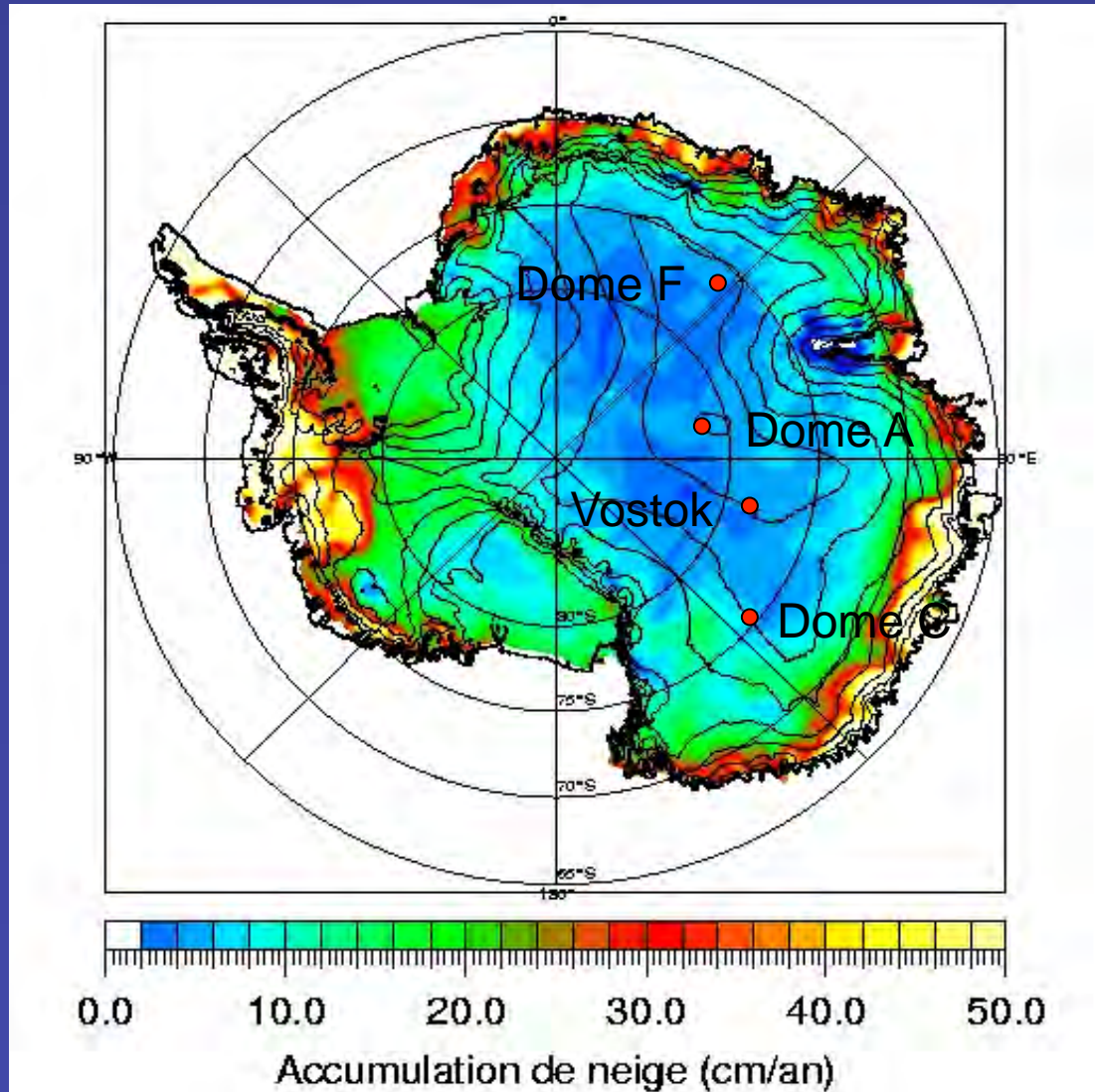
- Test causes of 40-100 ka change that call on CO₂ changes
- Test whether climate and CO₂ remain in step in a 40 ka world
- New examples to test the relationships between different parts of Earth system
- Test whether millennial scale variability persists under different conditions
- Further test hypotheses about triggers for deglaciation



The challenge

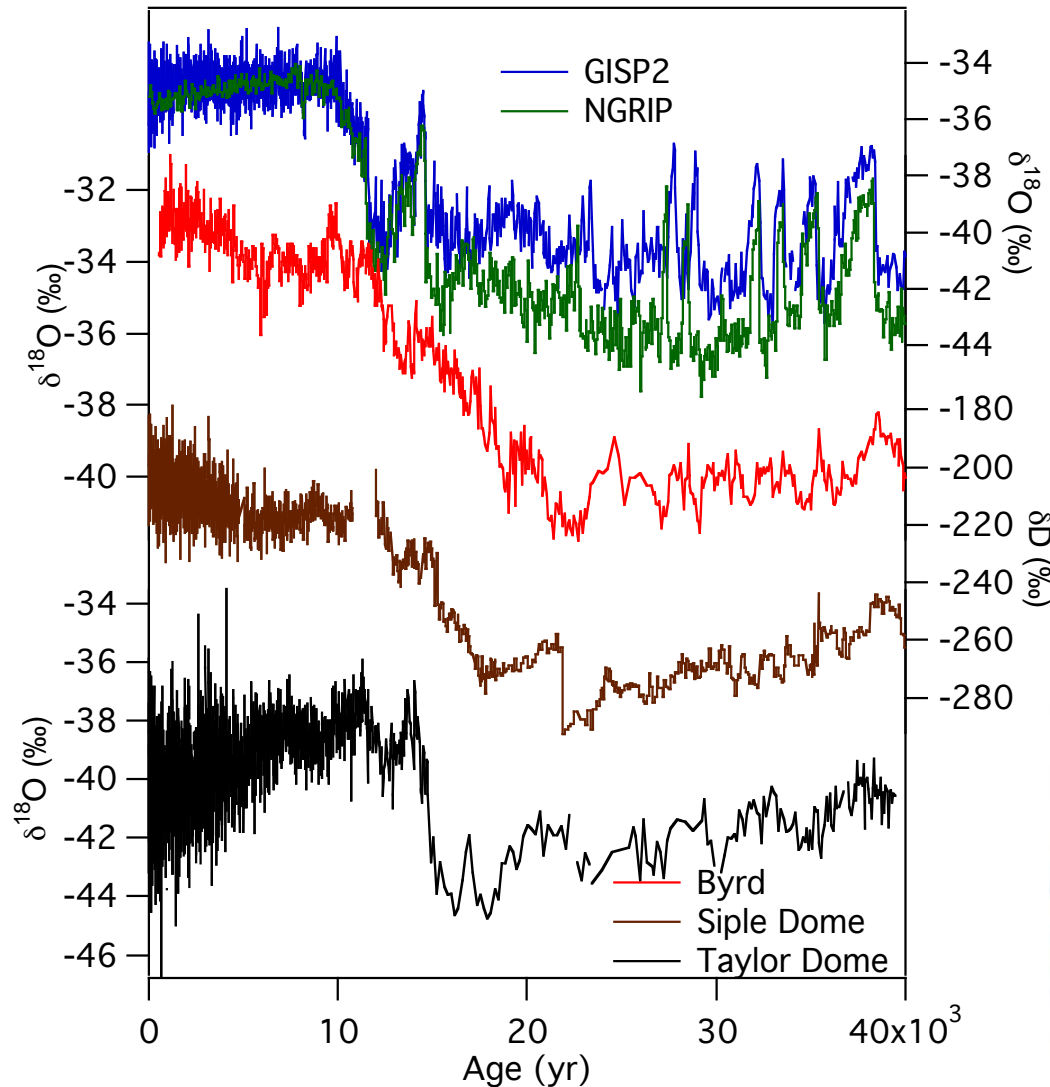
- to obtain a reliable ice core record of climate and biogeochemistry extending through several of the 40,000 year cycles and up to the present, requiring
- a replicated Antarctic ice core record extending at least 1.3 million and preferably 1.5 million years, into the past
- **Note that we aim for two sites!**

The Oldest Ice Core-Where?



- Low acc. site.
- Geophysical surveys first.
- Drilling in colder, more remote conditions than previously.
- Two cores needed for verification.

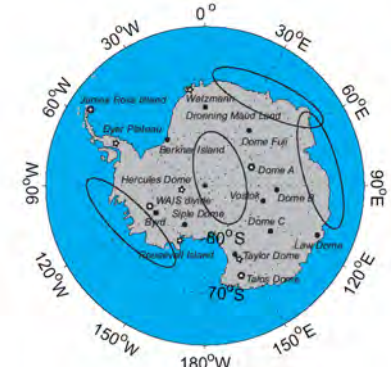
The IPICS 40,000 year network: a bipolar record of climate forcing and response



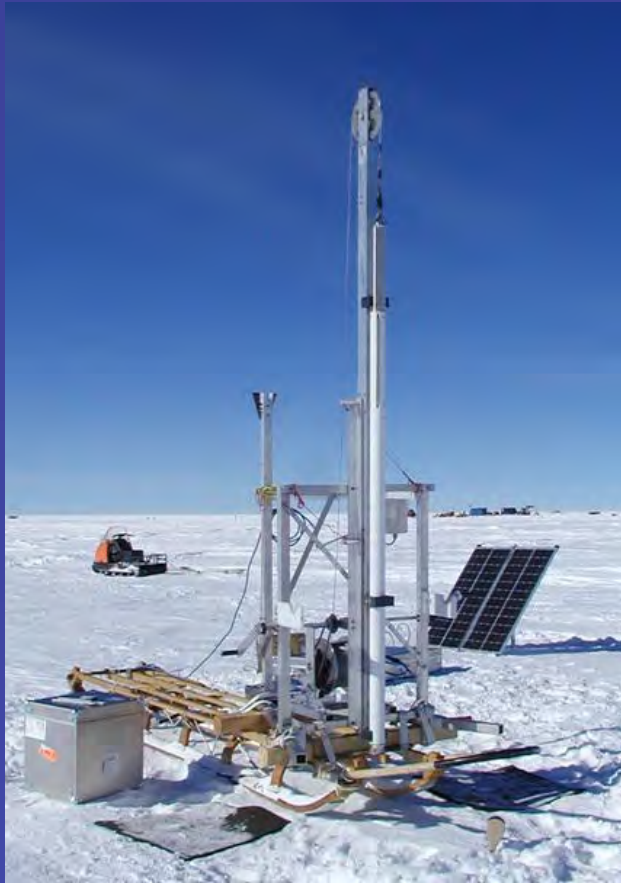
Why?

LGM-->Holocene is best documented large climate change

N-S phasing and regional differences are signatures of mechanisms



The IPICS 2k Array: a network of ice core climate and climate forcing records for the last two millennia



Why?

- Polar regions underrepresented in climate reconstructions
- Natural variability and its spatial patterns are important
- Solar forcing proxy (^{10}Be) available

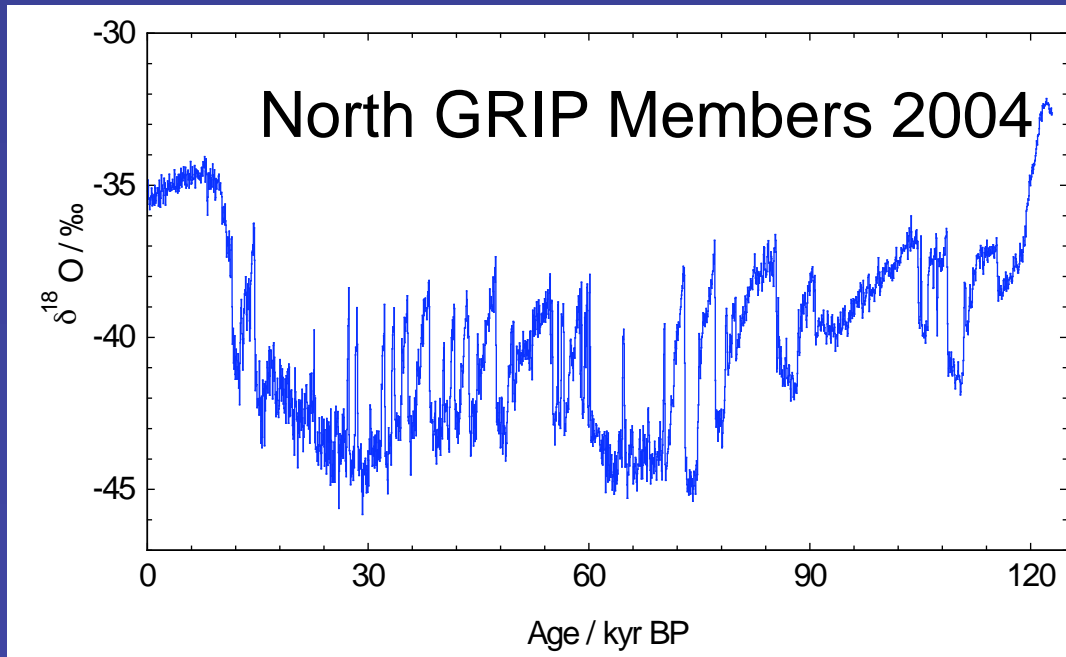


The IPICS 2k Array: a network of ice core climate and climate forcing records for the last two millennia

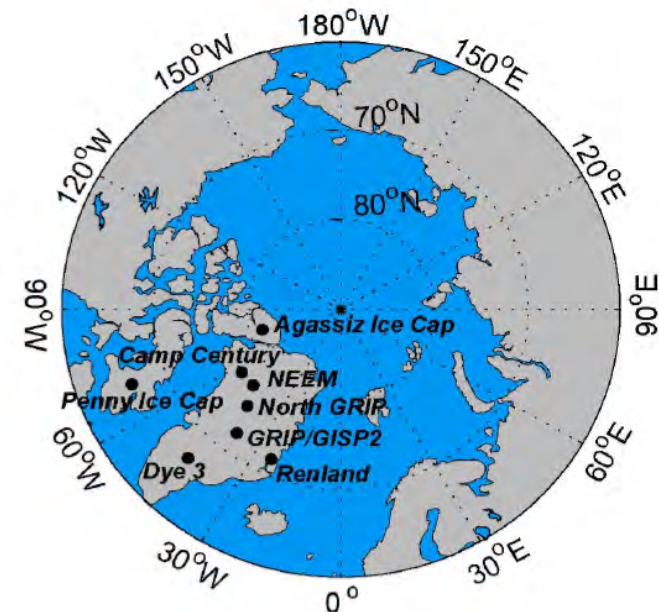
Where?

- Greenland, Antarctica: Following ITASE, but deeper
- **Tropics and mid-latitudes**
- Focus on annually resolved and dated records wherever possible.

North Eemian Project - Why?

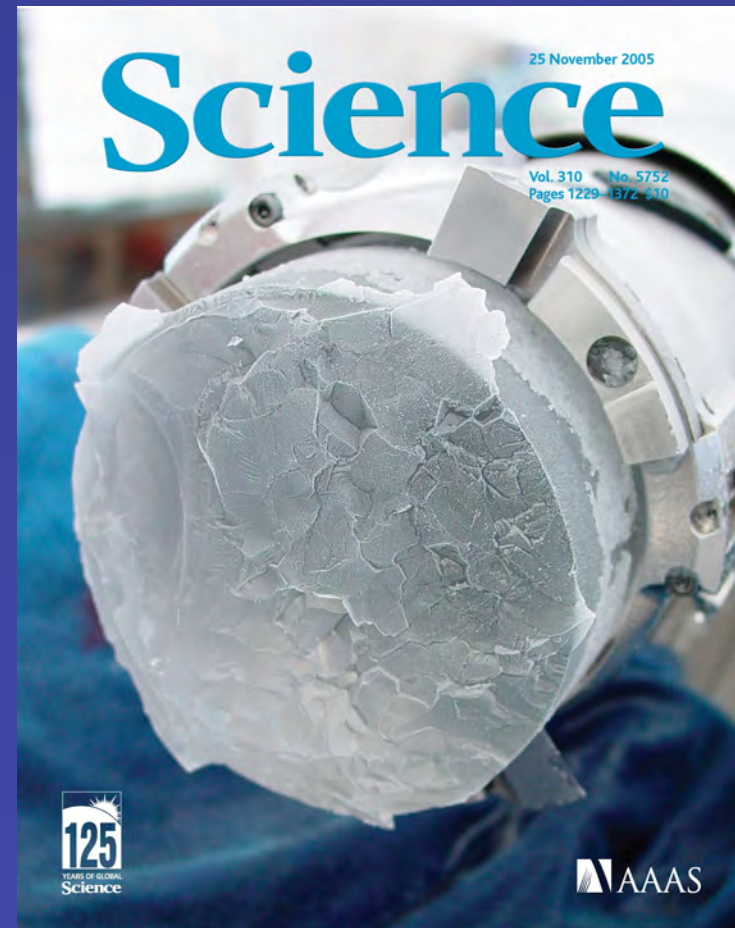


- No full Eemian and stage 6 records
- What did the Greenland ice sheet do?
- Eemian conditions analog for warmer world



Drilling Technology

- Essential part of IPICS
- Challenges
 - Drilling in colder environments
 - Environmental hazards of fluids, need for replacement fluids
 - Weight/cost of drills
 - Ice quality
 - Replicate coring in one borehole



Some political and logistic issues

- First requirement for “oldest ice” is survey; various airborne and ground campaigns planned in the coming years
- Oldest ice drilling likely to require ALL IPICS nations, extending the multinational models used for ice cores so far
- The arrays require adoption of best practice technologies by each participant, as well as facilities to synthesise the datasets into more than the sum of the parts

Status of IPICS

- Four “white papers” on projects available, plus one on drilling technology.
- Steering committee with sub-groups writing science plans for each project; will develop implementation plans
- Web site, including workshop reports and white papers available at:
<http://www.pages-igbp.org/ipics/>
- Meeting held in Oct 2012.