



# International Partnerships in Ice Core Sciences

## IPICS MISSION

- Defining and promoting priorities for international ice core science

## ORGANIZATION

- Active since 2002, Co-chairs: Ed Brook (USA, OSU) and Eric Wolff (BAS)
- 22 Nation membership. Steering committee, meetings in 2004,2005,2008,2009,2012.

## PRIORITY PROJECTS

- IPICS 2k - 2000 year array of ice core records
- IPICS 40K - 40,000 year array of ice core records
- Last Interglacial records
- Oldest Ice Core - goal is 1.5 Ma ice core record
- Technology - new drilling and exploration tools
- *See IPICS web site for science plans and other documents*



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## RECENT ACTIVITY

- IPICS Open Science Meeting, Giens, France, October 2012
- IPICS Oldest Ice Workshop, La Londe Les Maures, France. October 2012
- IPICS Special Issue CPD/TCD 2013
- Ice Coring
  - NEEM Project (*Nature* 493 January 24 2013)
  - New cores covering the last 40 ka, finished or in progress
    - Greenland: NEEM
    - Antarctica: Talos Dome, James Ross Island, Larissa (Bruce Plateau), WAIS Divide, Fletcher Promontory, Roosevelt Island
- New cores planned: Renland (Greenland), NEGIS, South Pole
- Synthesis efforts on 40 k climate (Pedro et al., 2011; Parrenin et al., 2012)
- Ice core contributions to PAGES 2k synthesis (PAGES 2k Consortium, 2013)



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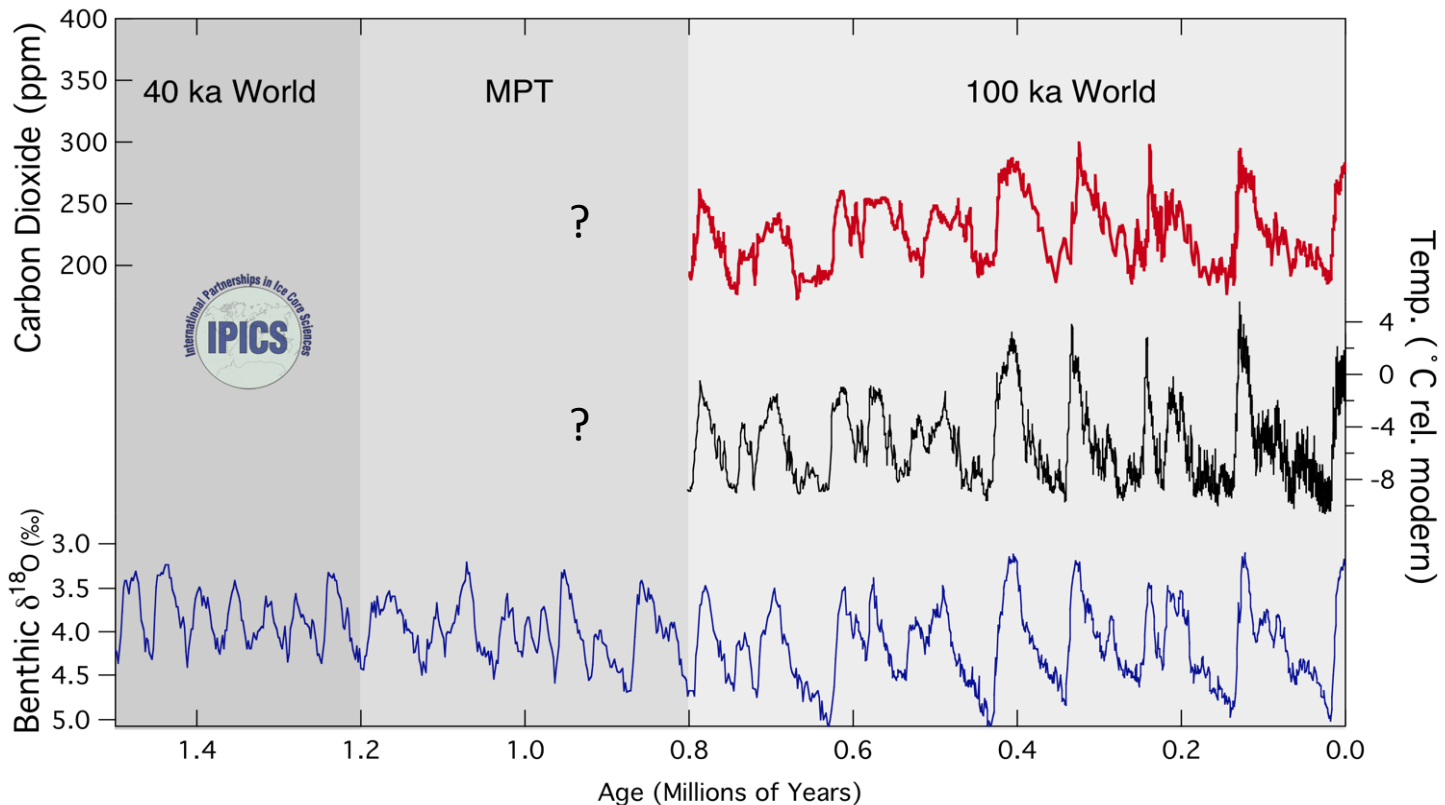
## FUTURE IPICS Activities

- 2nd IPICS Open Science Meeting, 2016 (Date and Location TBA)
- New initiative on ice core records of last interglacial
  - Targets in West Antarctica, East Antarctica, Greenland
- New initiative on non-polar ice cores in IPICS 2k
- New initiative on drilling to study ice fabrics, structures, and deformation



# International Partnerships in Ice Core Sciences

## Oldest ICE: IPICS Grand Challenge





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## An ice core reaching the 40 ka world would

- Test causes of 40 ka cycle that suggest southern and northern climate cancel in marine records
- Test causes of 40-100 ka change that call on CO<sub>2</sub> changes
- Test whether climate and CO<sub>2</sub> 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





# International Partnerships in Ice Core Sciences

## 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!

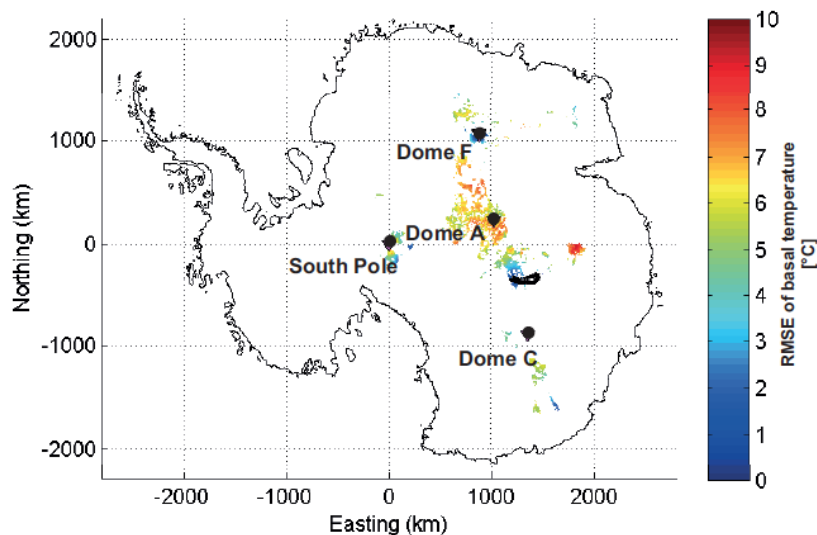


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## Where to Drill?



**Fig. 11.** Potential Oldest-Ice study areas, where horizontal flow is smaller than  $2 \text{ m yr}^{-1}$ , mean ice thickness larger than 2000 m and the bottom temperature below  $-5^\circ\text{C}$ . The color bar indicates the root mean square error of the basal temperature derived from a mode ensemble (van Liefferinge and Pattyn, 2013).

- We don't know yet
- The right sites are probably limited, but have low heat flow and not too thick
- **We need:**
  - **Geophysical surveys**
    - Airborne geophysics
    - Heat flow information
  - **Access drilling**
    - US RAID Drill
    - Other access technologies
    - Multiple deep cores
- **We envision**
  - An international effort to recover and analyze multiple cores