



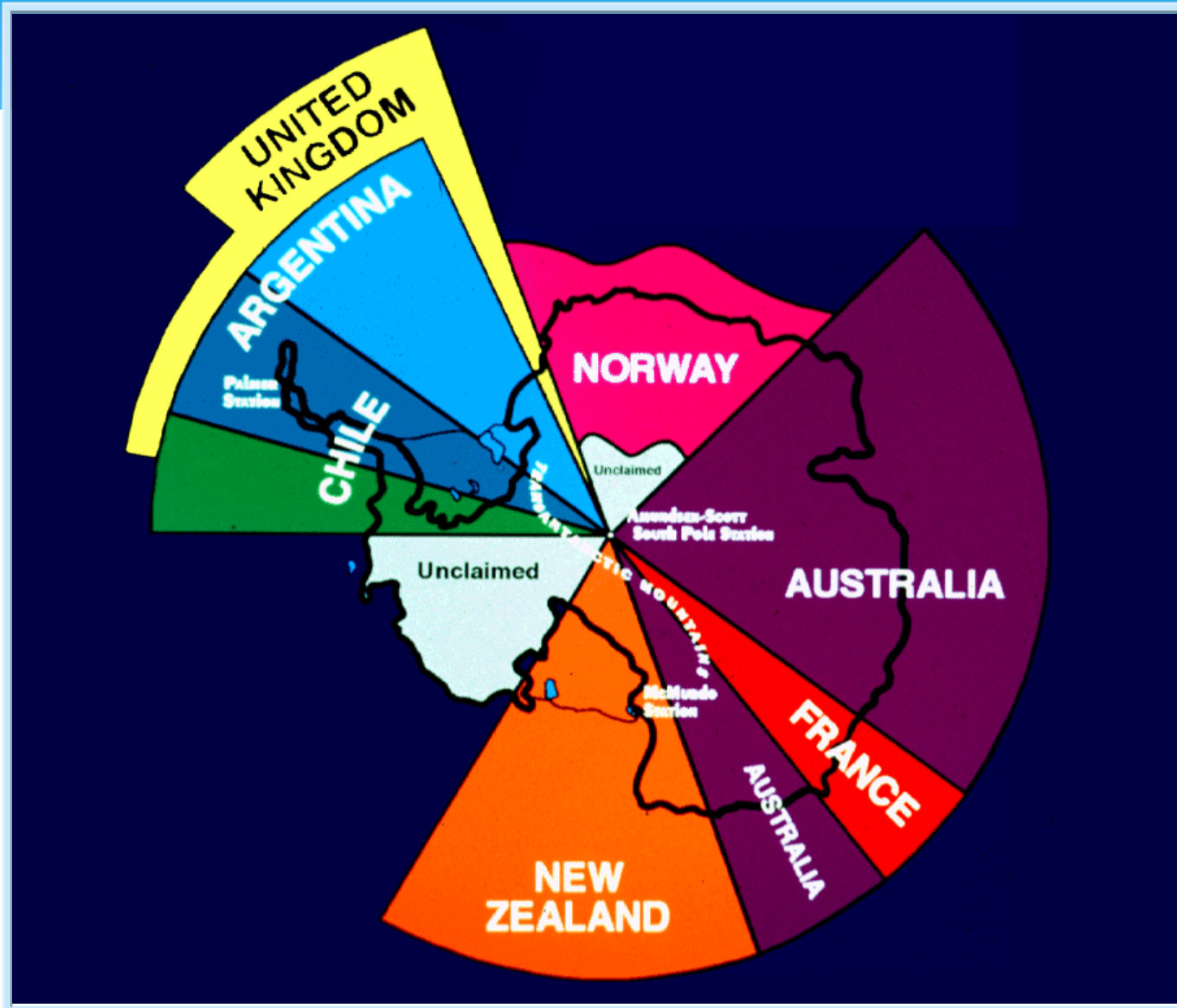


# United States Antarctic Program (USAP)

- **Management and budgeting for the USAP is the responsibility of the National Science Foundation, an independent federal agency**
  - **Presidential Memorandum 6646**
- **Participating federal agencies include NASA, NOAA, USGS, EPA, DOE, Smithsonian, State, DOD, USCG ...**
- **Support from DoD includes Air National Guard, Air Force, Navy (Military Sealift Command/NAVCHAPS/Seabees)**



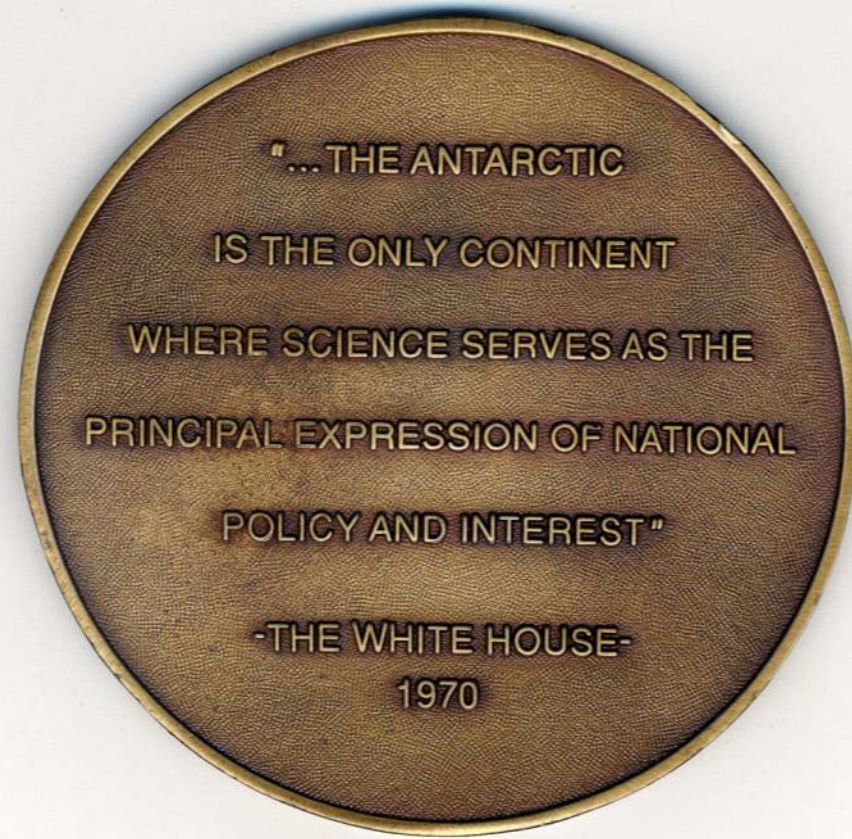
# Antarctic territorial claims

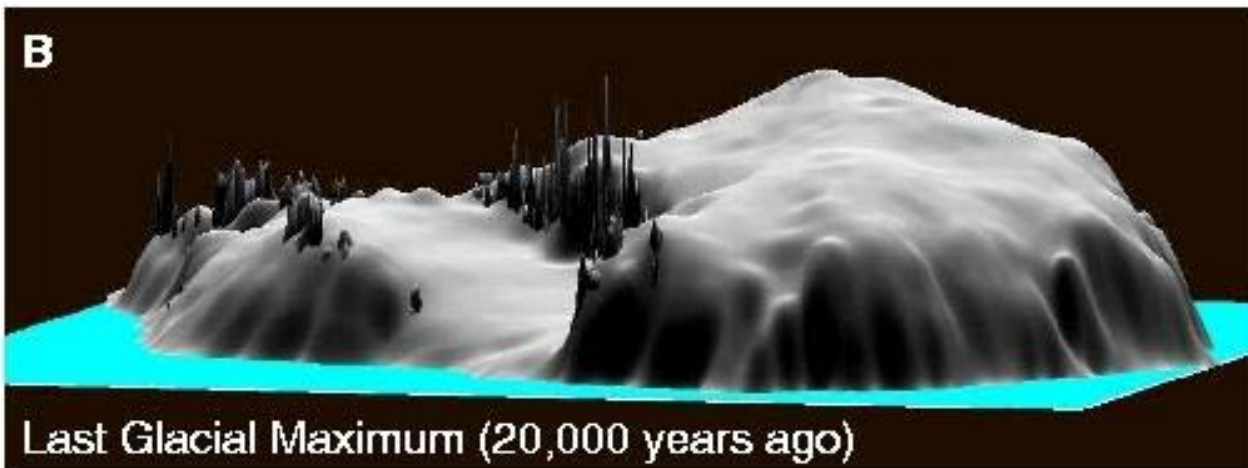
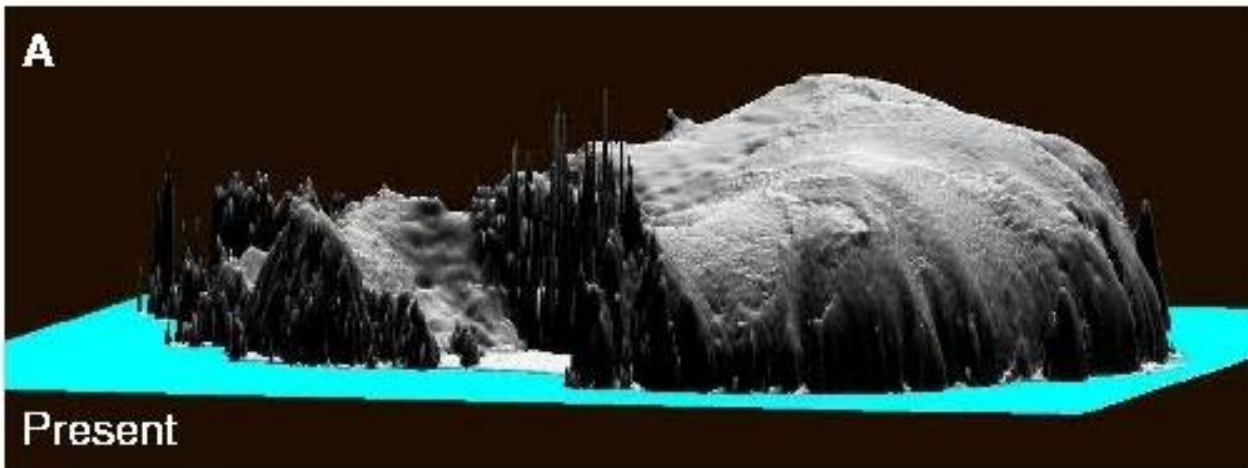




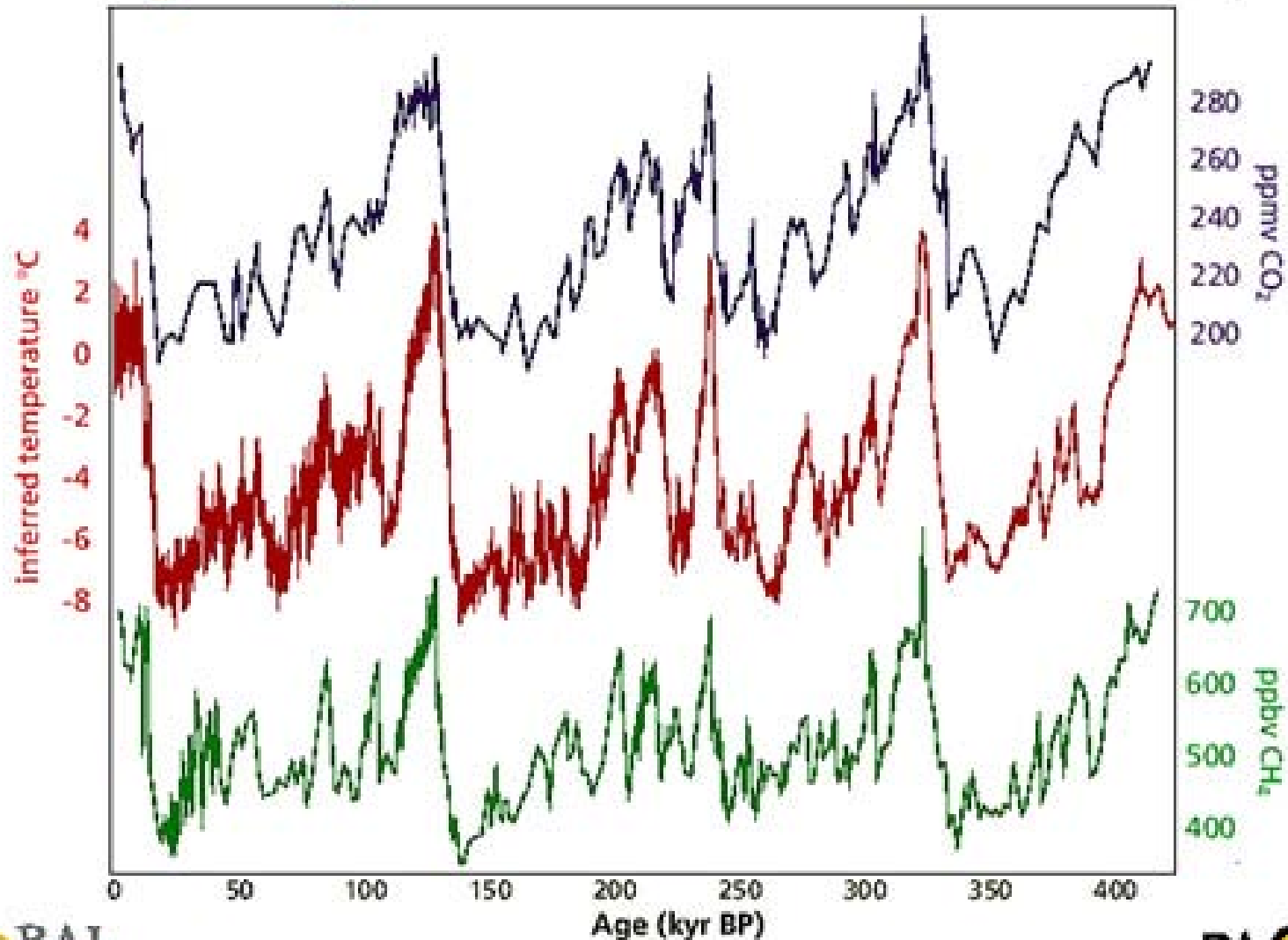


# The science continent





## 4 glacial cycles recorded in the Vostok ice core

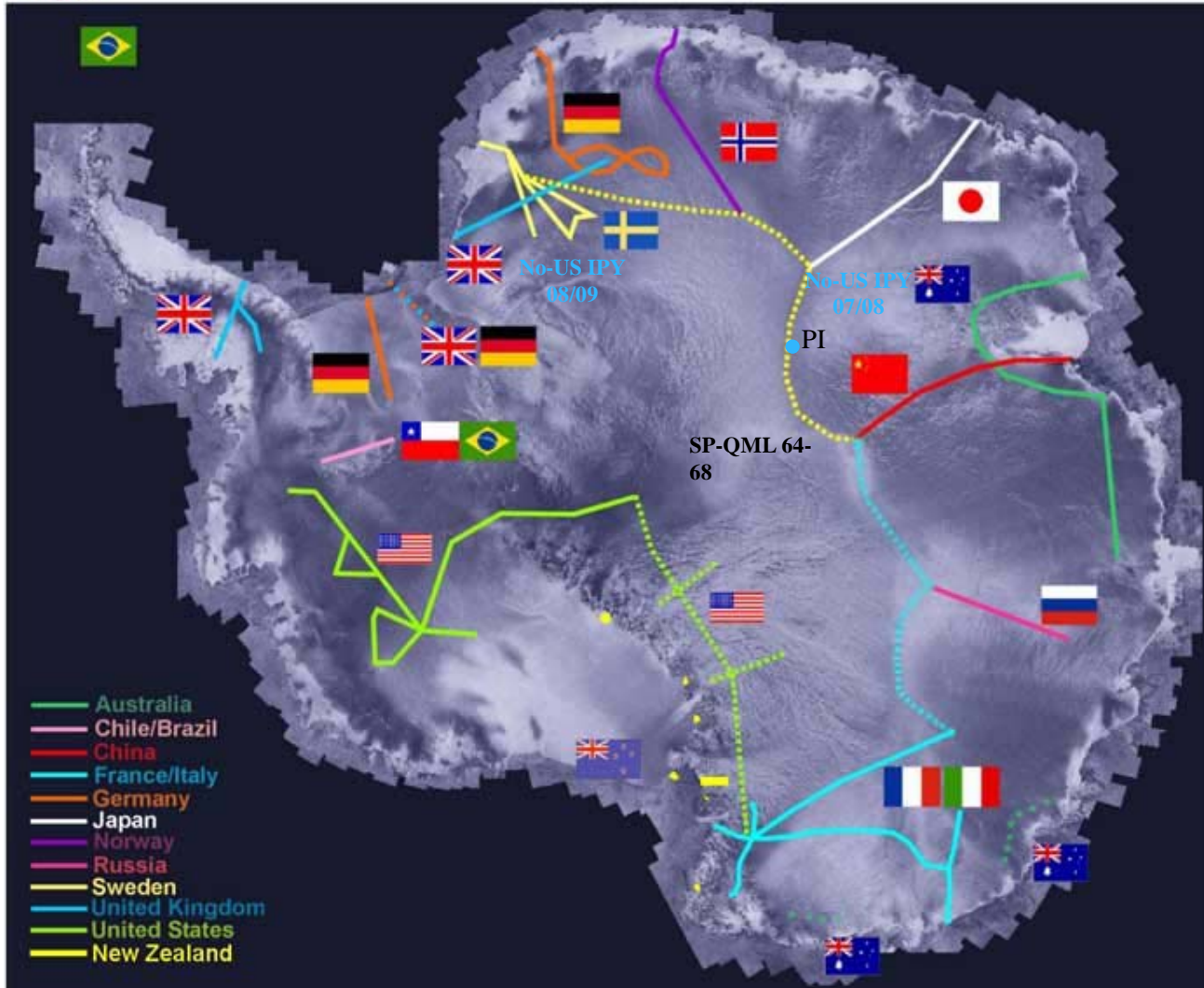




# ITASE and IPY



International Trans-Antarctic Scientific Expedition



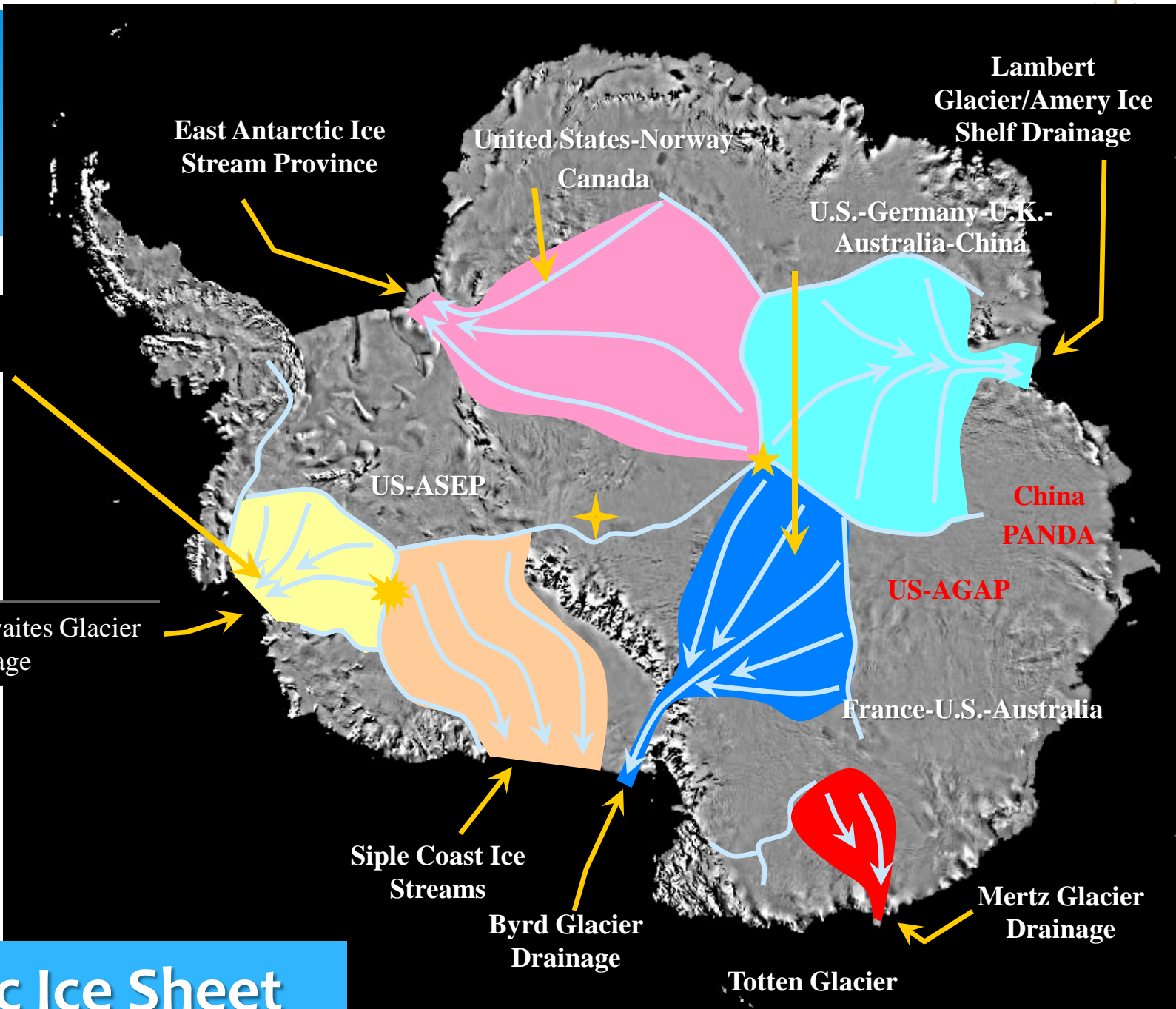
- Eight traverses during 07-09 IPY time frame
- Builds on several prior traverses
- Will set stage for continent scale synthesis of accumulation and temperature records.



United States-  
United Kingdom

Pine Island/Thwaites Glacier  
Drainage

# Antarctic Ice Sheet

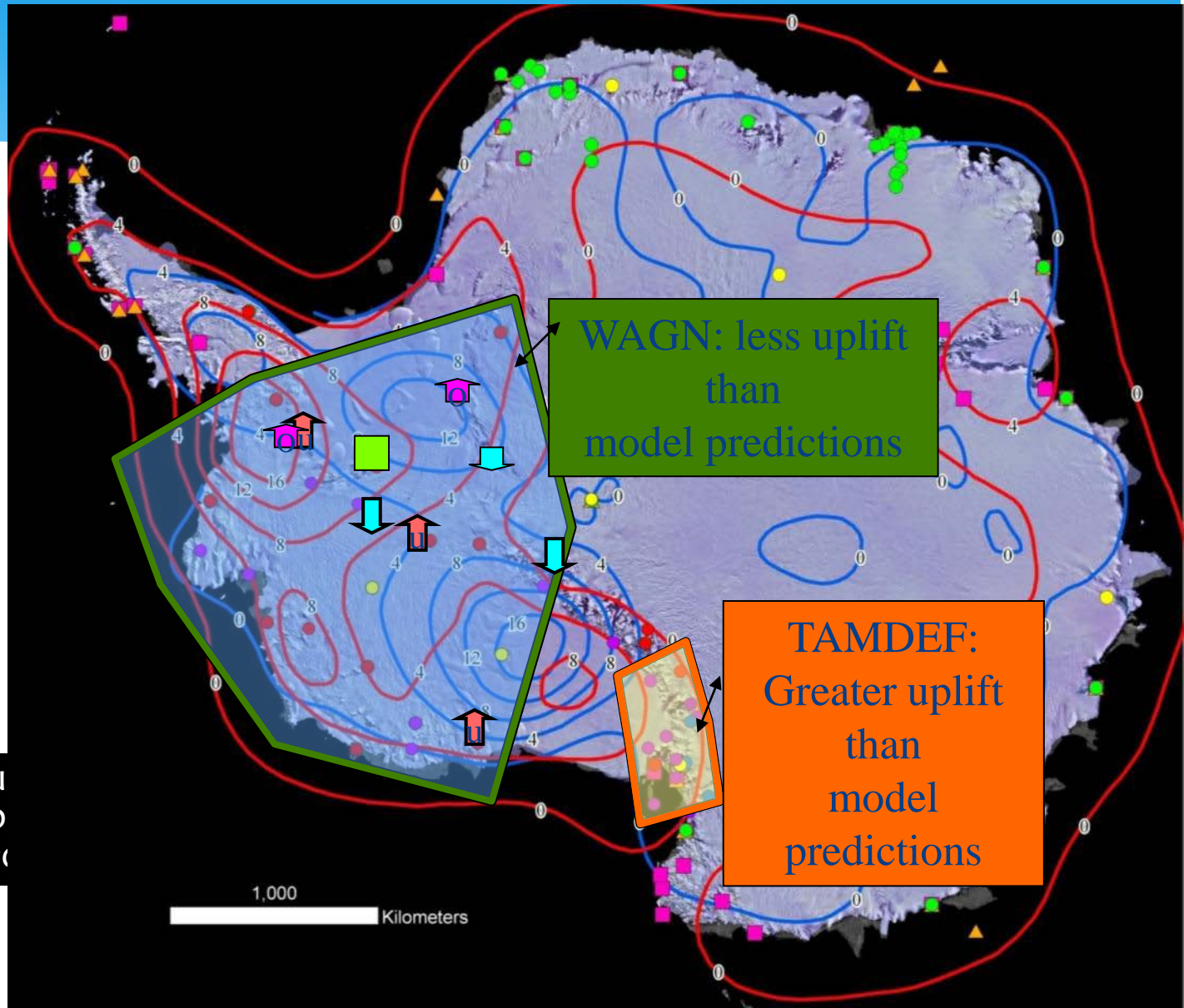






# POLENET: The Polar Earth Observation Network

- Contribution of polar ice sheets to global sea level change in a warming world?
- GRACE satellite system measurements depend critically on ground truth for PGR – Post Glacial Rebound.



Initial GPS resu  
PGR models inco  
Revise PGR 'corre



# Ice Mass Loss in West Antarctica

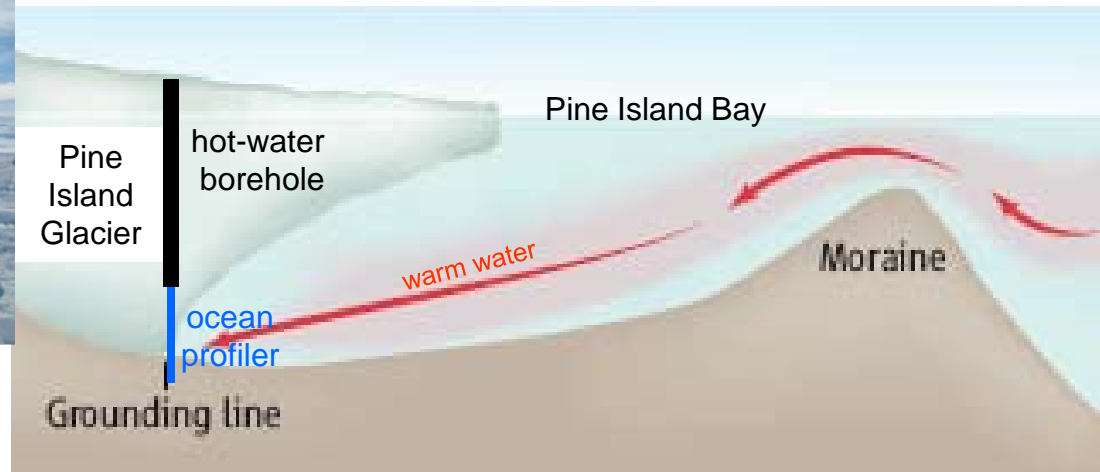
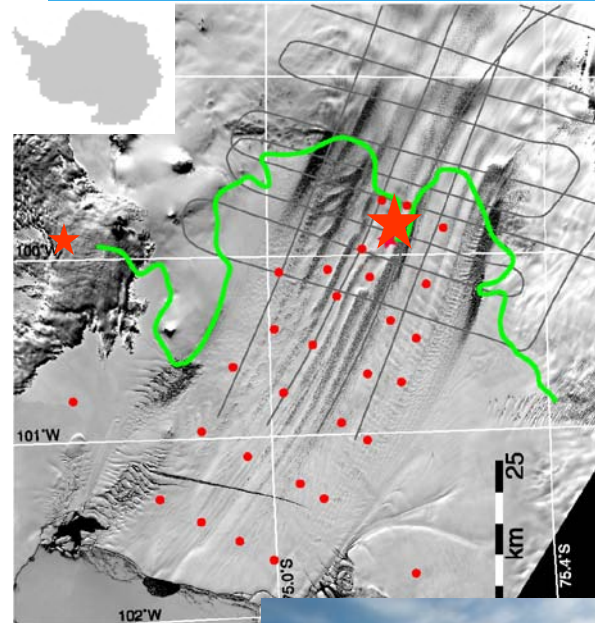
## Future contribution to sea level rise.

- \* Pine Island Glacier Study:

- \* 8 institutions, 13 investigators, 2 countries, and 3 funding sources:

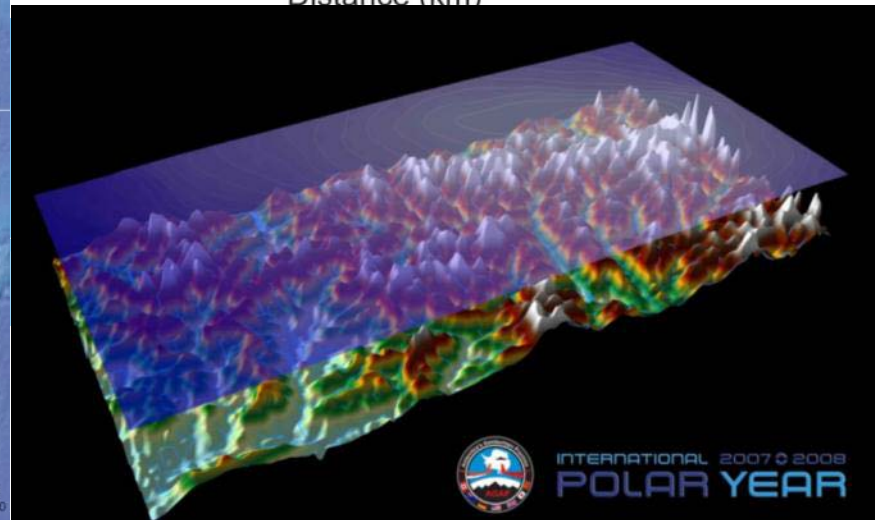
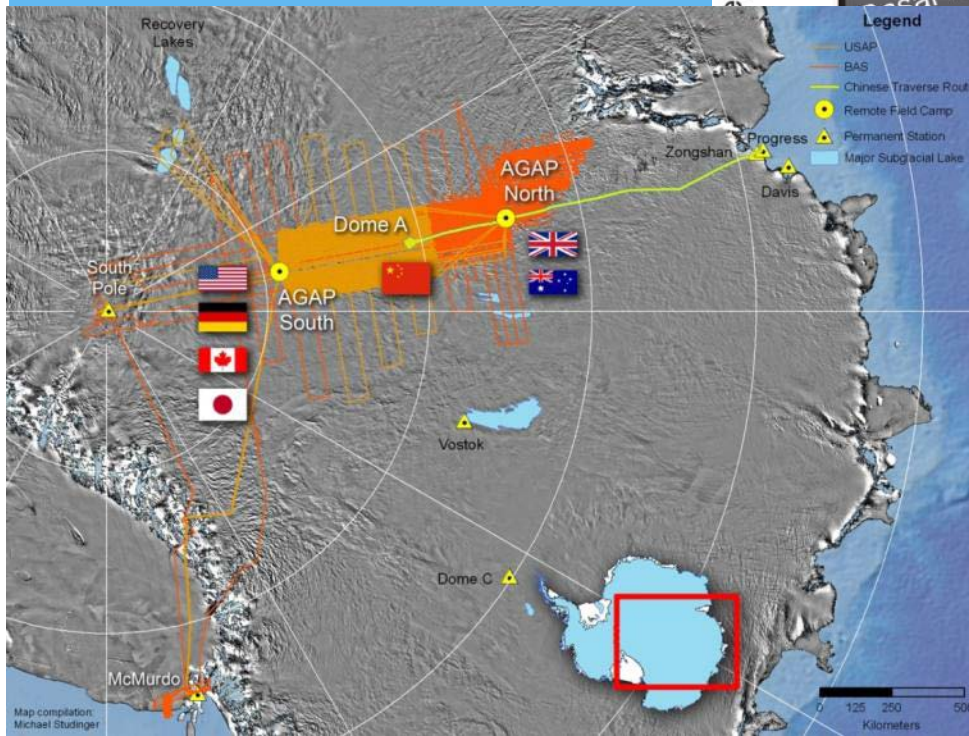
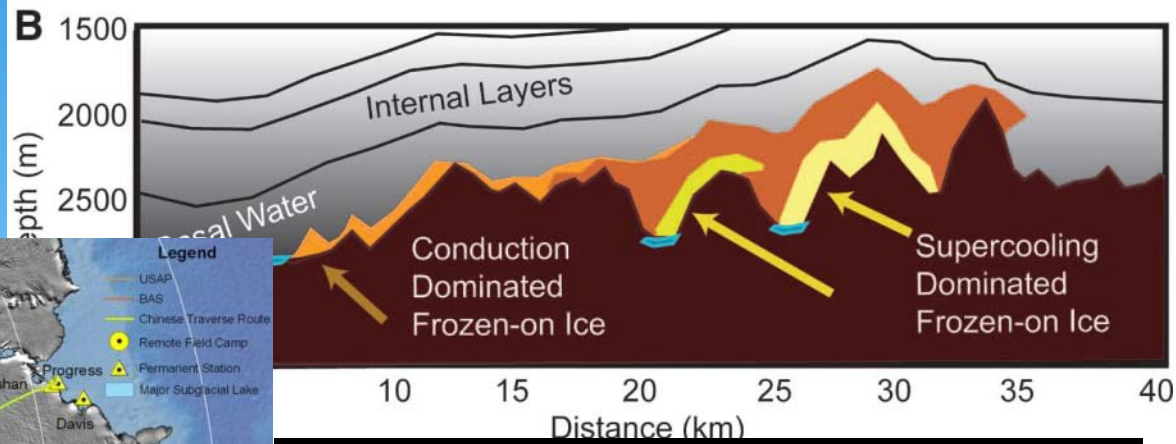
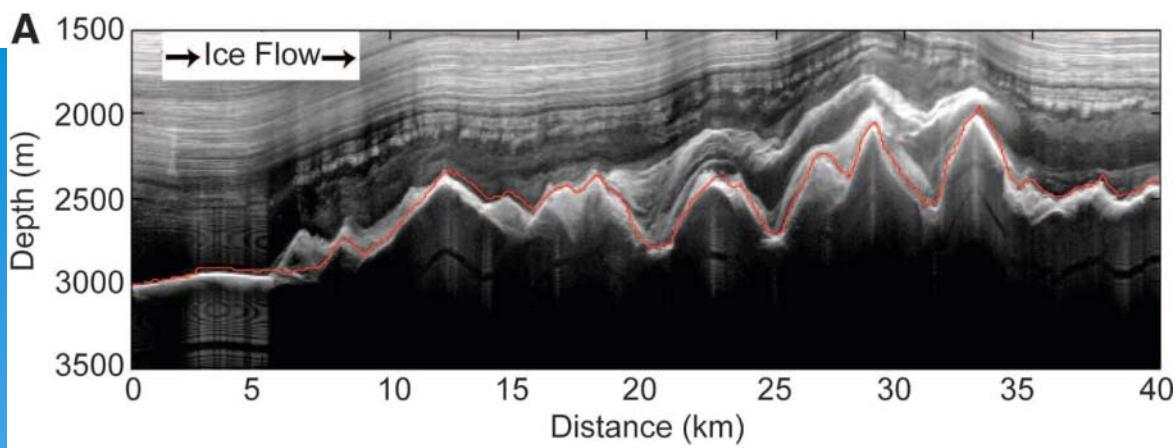
- \* NASA, New York University, Naval Postgraduate School, University of Alaska, Penn State, McPhee Research Corporation, British Antarctic Survey, University of Bristol

Three ice boreholes through 550-m thick ice shelf will permit video-camera exploration of sub-shelf environment and deployment of new oceanographic profilers to measure evolving water properties for up to three years.





# Beneath the Ice Sheet with Ice-Penetrating Radar





# Concordiasi (France - US Collaboration)

- Balloon payloads to provide “ground truth” for satellite borne hyper-spectral sounder (IASI).
- Meteo-France and CNRS, CNES; NCAR, University of Wyoming, Purdue University, U Colorado, UCLA, NASA GSFC; PNRA Italy; IPEV, France, ECMWF – UK
- Technology Development



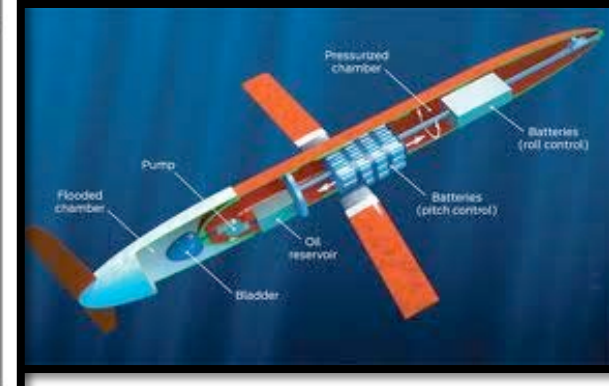
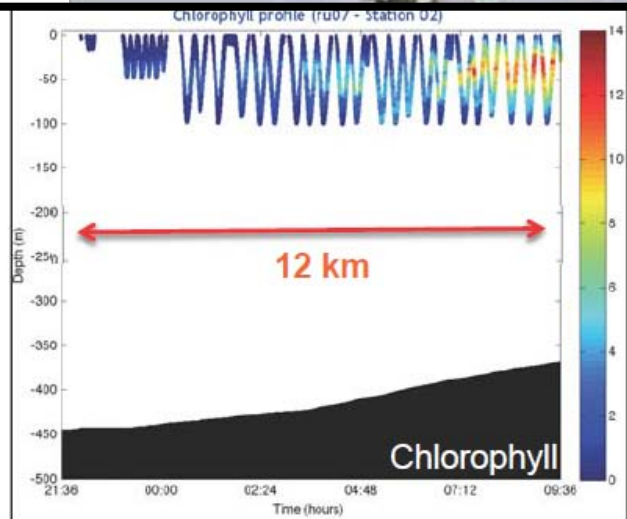
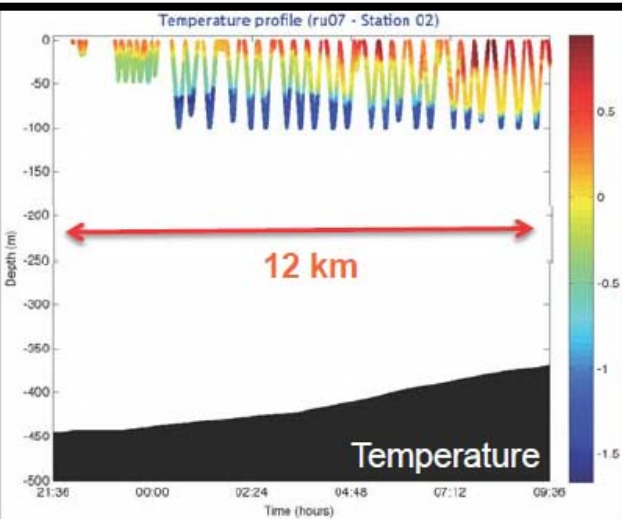
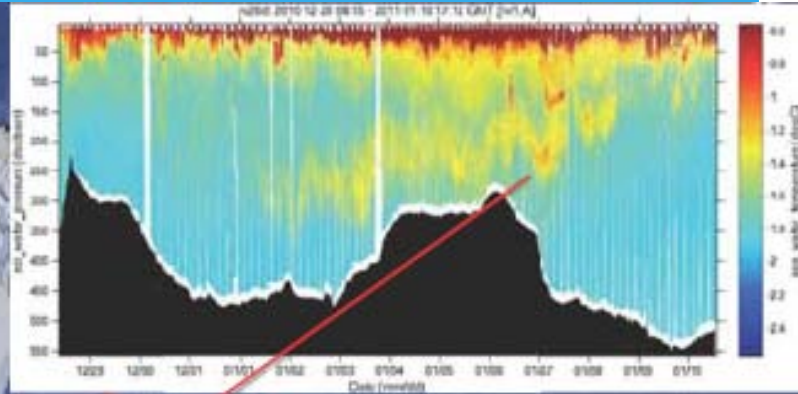




# U.S.- Sweden Research Collaboration 2006-2010



# Technology: Gliders





# Ice Fish! – An Evolutionary Mutant Model



- Environmental stresses lead to mutations that allow organisms to survive and thrive
- Sometimes these “mutations” mimic human diseases and are thus of interest for human health
- Ice-Fish: no hemoglobin, environmental compensation is very high dissolved oxygen in cold water – relevant to anemia: what genes control hemoglobin production
- Many Antarctic fish – lower skeletal mass – favored by need to move through water column using a small amount of energy – relevant to genetic underpinning of osteoporosis

Drs. R. Craig Albertson (Syracuse University), William Cresko (University of Oregon), H. William Detrich (Northeastern University), and John Postlethwait (UO), Trends in Genetics (2009, v.25, no.2, pp. 74-81)

[HHMI Video: http://media.hhmi.org/fittest/birth\\_death\\_genes.html](http://media.hhmi.org/fittest/birth_death_genes.html)





# Astrophysics

New insights to the formation  
of the early universe.



- Three productive seasons of observations
- First galaxy clusters discovered using only the S-Z effect
- New population of high-redshift star-forming galaxies discovered
- Future work in B-mode polarization of the CMB

- 10m Sub-millimeter South Pole Telescope
  - First light achieved in February 2007
- Search for *Dark Matter* and *Dark Energy* testing cosmological models for the origin of the universe





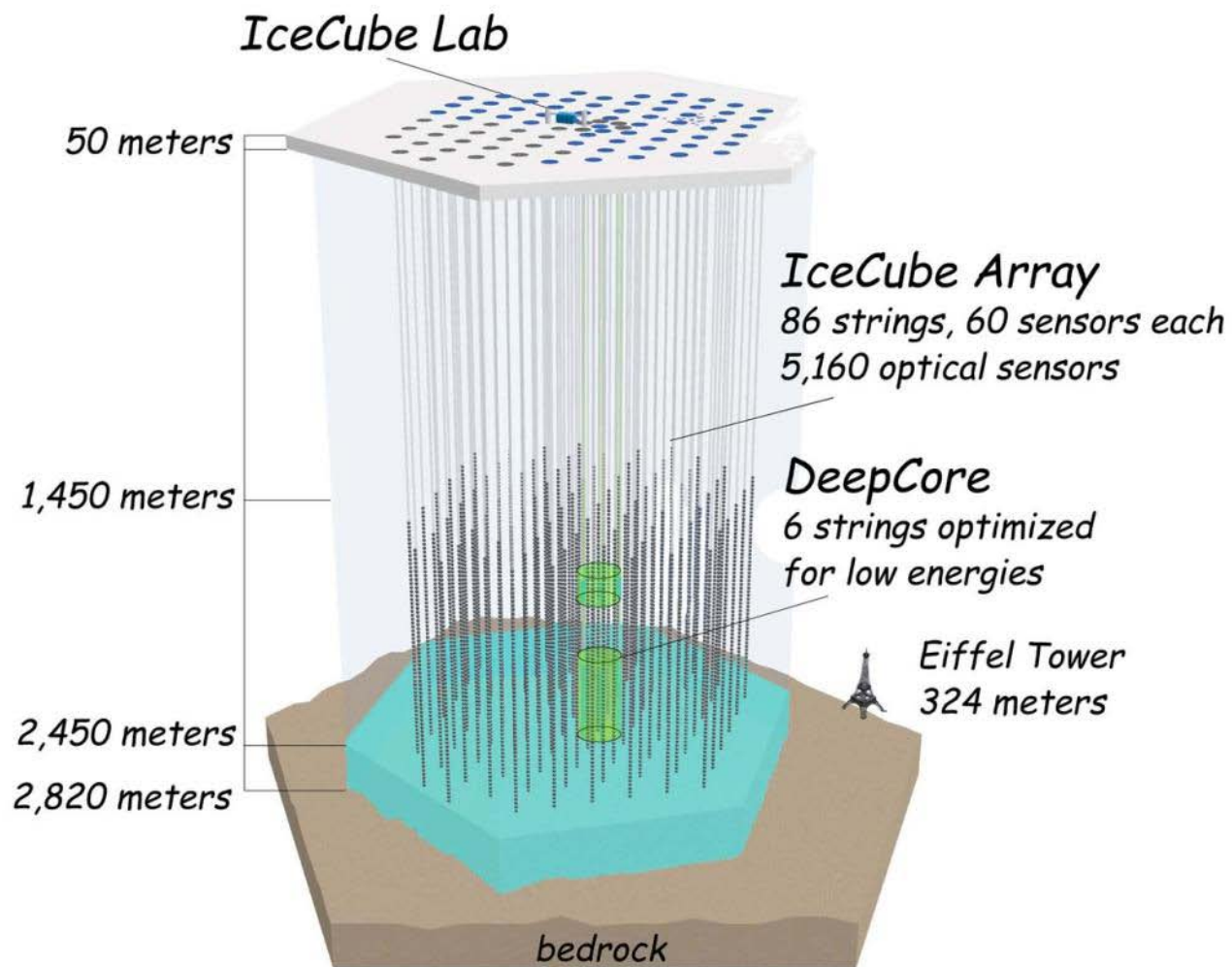
# IceCube

Observatory Complete  
80 Regular Strings  
6 Deep Core Strings  
IceTop Array

Detector functioning  
better than  
anticipated

Science exploitation is  
underway

Broad International  
Collaboration





# Amundsen-Scott South Pole Station, February 2011





# Some USAP Challenges

- **Station Resupply (icebreaker and supply ships)**
- **Energy**
- **Satellite Connectivity/Bandwidth to South Pole and far southern field stations**
- **Ice-strengthened Research Ship**
- **Agility to meet evolving research frontiers**





# Ships supporting the U.S. Antarctic Program





**Technology:  
Energy  
(U.S.- N.Z.  
Partnership)**



**Wind Turbines  
and diesel  
generators at  
McMurdo Station**



# Antarctic reviews (some highlights)

- **1949: *Antarctic Research—Elements of a Coordinated Program* (NAS)**
- **1961: *Science in Antarctica 1* (Life Sciences) and *2* (Physical Sciences) (NAS)**
- **1970: *Polar Research—A Survey* (NAS)**
- **1981-1985: *Polar Research—A Strategy* (NAS)**
- **1996-1997: *United States Antarctic Program* (NSTC) and *United States in Antarctica* (External Panel)**
- **2010-2011: science drivers (NAS) and engineering effectiveness (blue ribbon panel)**



# The 2010-2011 USAP Review

## Being Organized by NSF & OSTP

To set the stage for the next two decades of U.S. research, discovery and environmental stewardship in Antarctica in the most effective, efficient, sustainable. . . .

And conducted in two phases to

- 1) Identify science drivers (NRC Panel)
- 2) Identify options for associated required logistics and infrastructure (External Blue Ribbon Panel)