

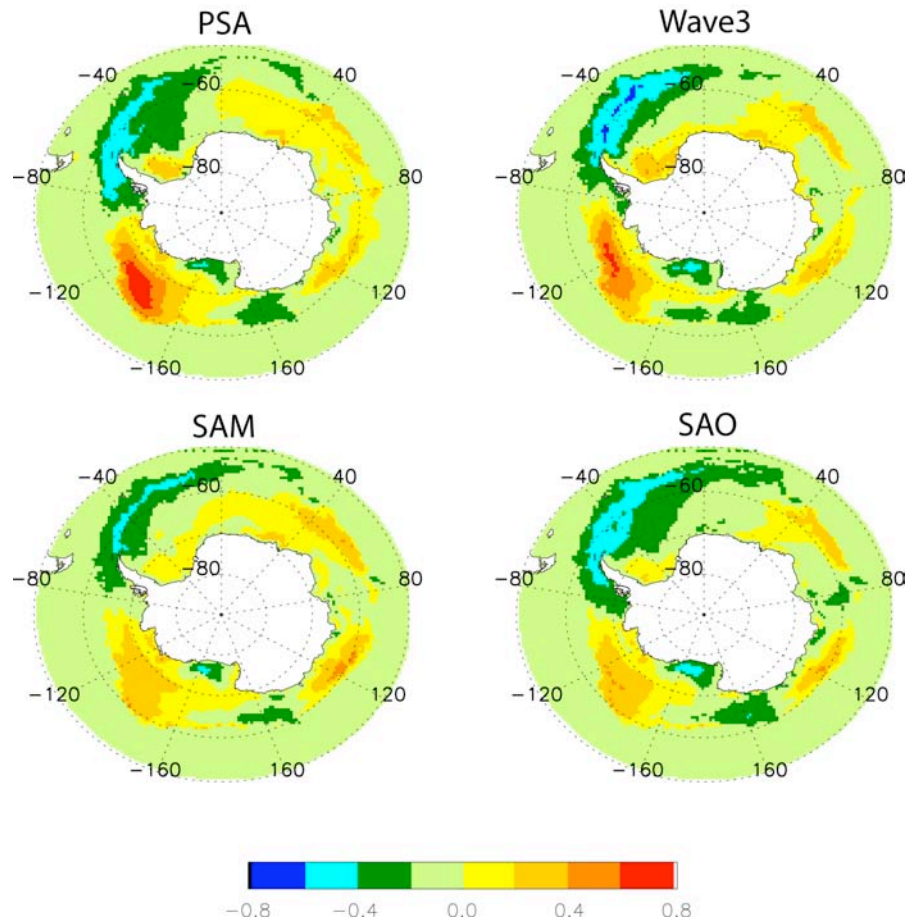
# Southern Ocean CLIVAR/CliC/SCAR panel

## OOPC - 11

presented by Yasushi Fukamachi on behalf of the SO panel



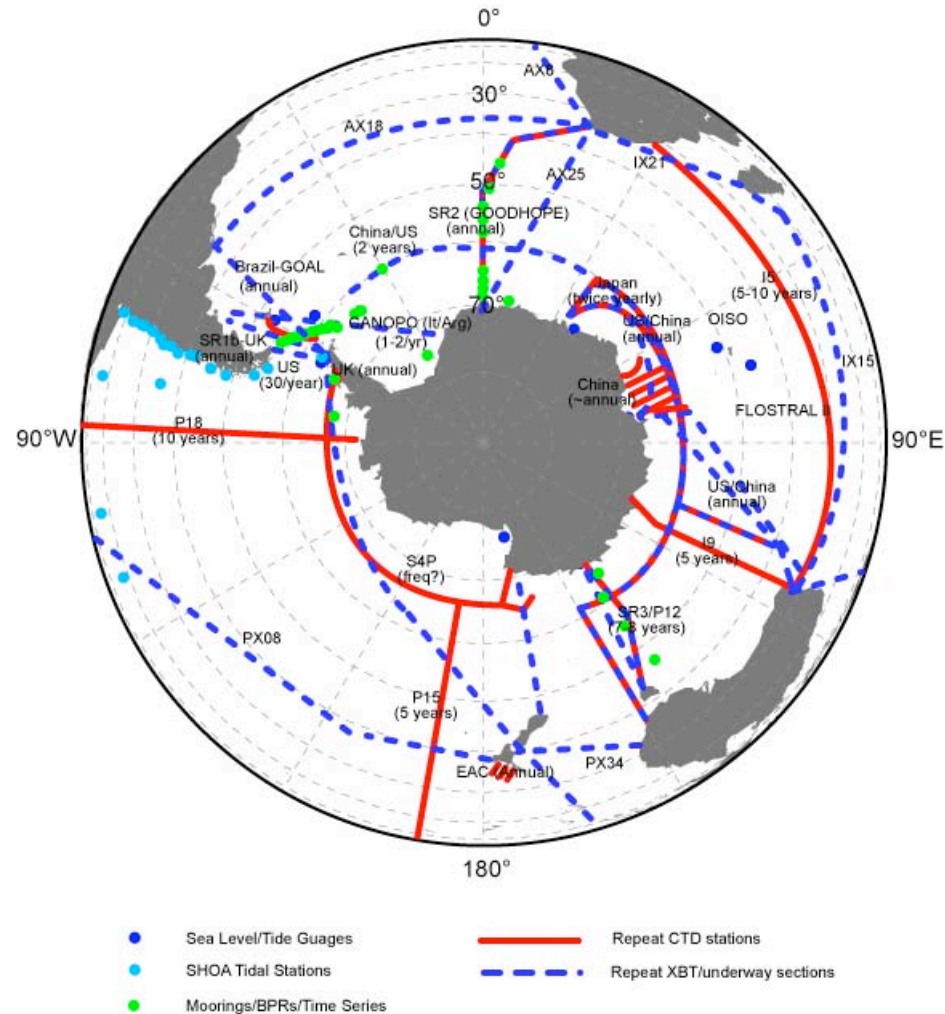
# Correlation between Climate Modes and Sea Ice Concentration anomalies



The impacts of different climate modes on sea ice extent are examined by correlations shown in this figure. Apparently, PSA and Wave-3 patterns are strongly correlated with the Antarctic Dipole in sea ice in the western Hemisphere and generally have higher correlations than SAM and SAO. The influences of SAM and SAO on sea ice are more evenly distributed around Antarctica. Since all climate indices and sea ice concentration anomalies were filtered prior to the correlation by a Gaussian filter with filter length of 13 months, these correlations represent shared variance on interannual and longer time scales.

Correlation coefficients between Antarctic sea ice concentration anomalies (lag of 2 months) and time series of the Pacific South American Pattern (PSA), Wave-3 pattern, Southern Annular Mode (SAM) and Semi-Annual Oscillation (SAO).

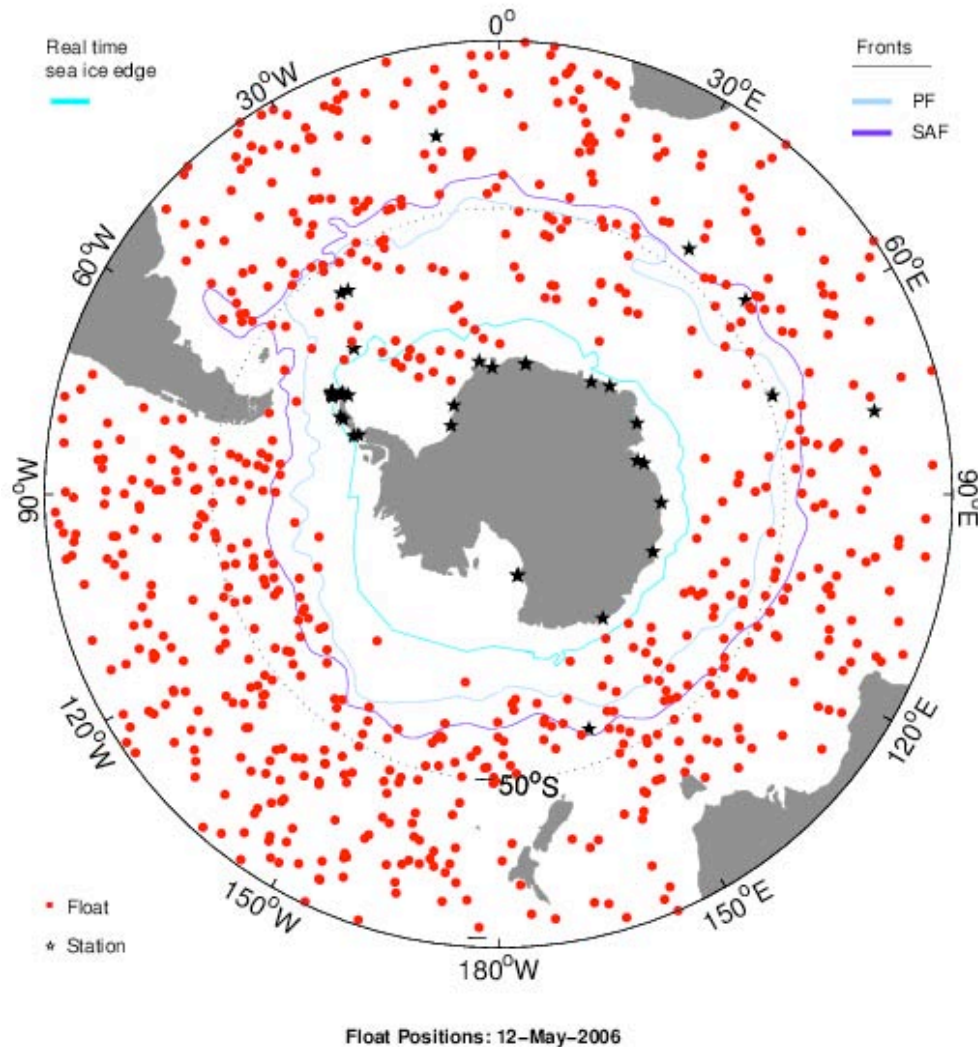
# Southern Ocean Sustained Observations



[http://www.clivar.org/organization/southern/CLIVAR\\_CliC\\_Obs.html](http://www.clivar.org/organization/southern/CLIVAR_CliC_Obs.html)



# Southern Ocean Argo

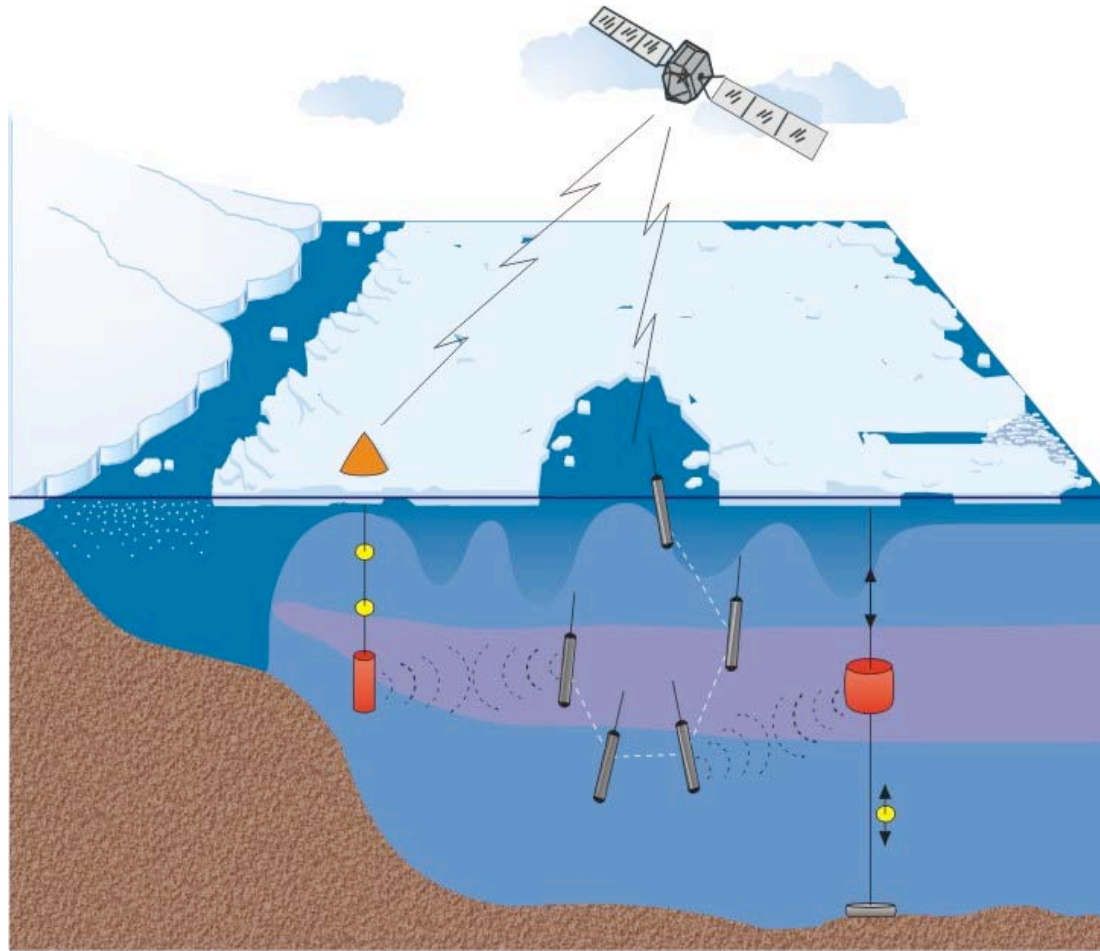


**Argo array has significantly increased amount of data available in Southern Ocean**

**However, Argo will not resolve climate modes until array extends into the sea ice zone**

**Remember - dots are large and amount of data we have (particularly in winter) is small!**

<http://argo.ocean.fsu.edu/>



**Hybrid Antarctic Float Observation System (HAFOS) combining sea-ice drifters, profiling floats and moored instruments to achieve long term measurements in the ocean under the sea ice with spatial coverage comparable to the global Argo system.**

# Enhancements Required

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- **Argo**
  - **Maintaining and re-seeding array (need to increase no. of floats)**
  - **Under sea ice**

# The Sea-ice Zone

## WCRP/SCAR International Program for Antarctic Buoys (IPAB)

- Development of buoys designed to withstand seasonal melting/freezing in sea-ice zone a priority (e.g. National Ice Center and Cold Regions Research and Engineering Lab. In US have recently initiated such a project)
- Problem of ship deployment opportunities, particularly during IPY (i.e. IPY BEARDS proposal)
- An important development has been initialized by the National Ice Center and NOAA, in developing inexpensive, Air-Droppable Ice Buoys Suitable for Marginal Ice Zone Deployment

IPAB Homepage (soon to be launched):

<http://www.ipab.aq>, hosted at <http://www.ipab.awi-bremerhaven.de>

IPAB IPY BEARDS (Bouys Encompassing the AntaRctic: an enhancement Deployment Strategy) proposal;

<http://www.ipy.org/development/eoi/details.php?id=108>

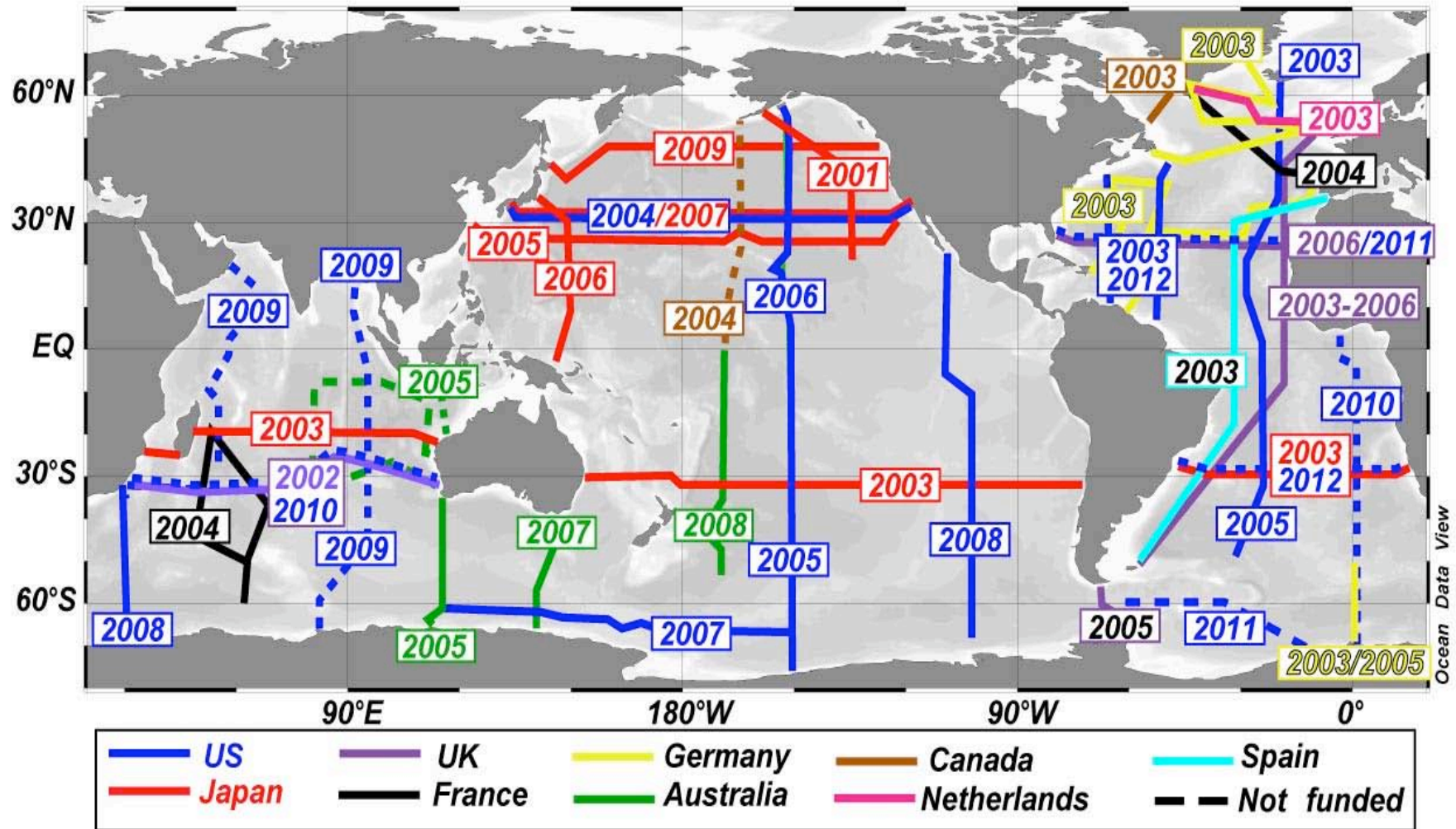


# Enhancements Required

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- **Argo**
  - Maintaining and re-seeding array (need to increase no. of floats)
  - Under sea ice
- **Sea ice zone**
  - Sea ice thickness/volume
  - Ocean properties under sea ice
  - Expanded met buoy network - need ships for deployment
  - Coastal margin; onshore-offshore exchange

# Repeat Hydrography etc.



# Southern Ocean HD XBT Lines

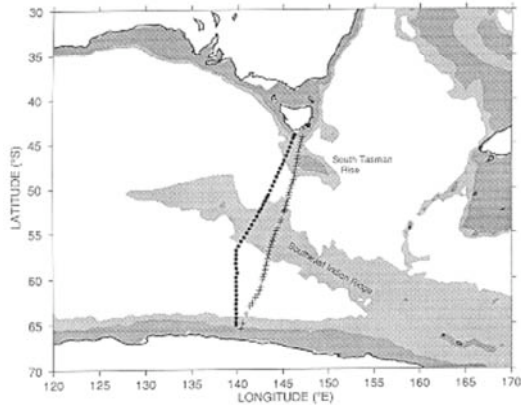
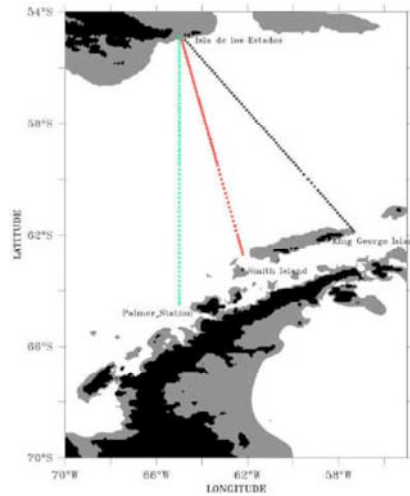
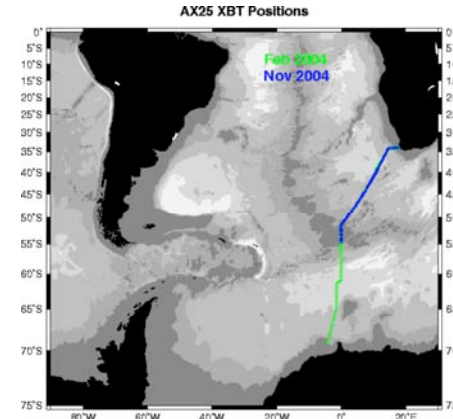


Fig. 1. Cruise tracks of *Astrolabe* (—) and *Aurora Australis* (●). Depths less than 3500 m (2000 m) are indicated by light (heavy) shading.

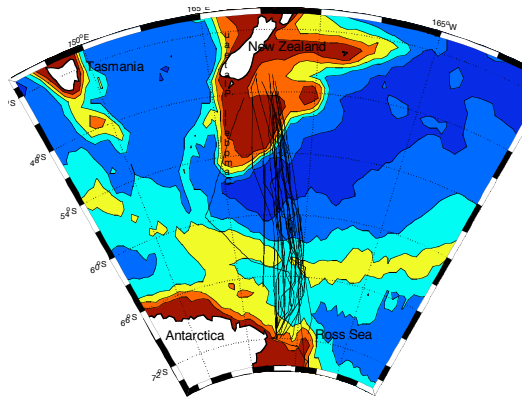


Drake Passage (XBT/XCTD/C O2 6-8x per year; ADCP 2-4x/mon; SIO)



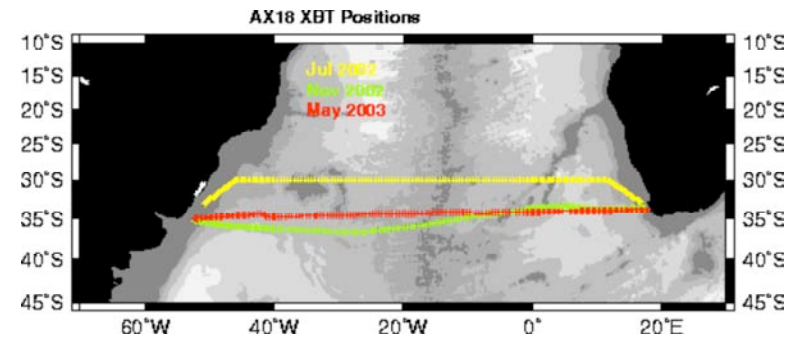
AX25 (SA to AA) twice a year (GOODHOPE)

Tasmania-AA (6x/summer - n.b. aliasing; SURVOSTRAL)



Only Drake Passage approaches needed sampling rate...

Should upgrade ADCP to deeper profile



Trans-Atlantic (0-2x/yr; NOAA AOML)

NZ-AA (2-4/yr summer - n.b. aliasing; CLIMA)

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  - Coastal margin; onshore-offshore exchange
- Repeat hydrography + tracers
  - Good plans, but not all funded

# Meteorology

- New development is the AMPS, Antarctic Mesoscale Prediction System: numerical forecasting using polar MM5 model at resolution of 20 km over continent and much of Southern Ocean. There are also higher resolution sub-domains over the Peninsula, McMurdo, & South Pole. Running for 2-3 years and people are starting to look at its quality, etc. It may bring some further quality to atmospheric representation over the southern ocean
- Potential for improved Met return from VOS (Volunteer Observing System) and IMET (Improved Meteorology) equipped ships - Council of Managers of National Antarctic Programs (COMNAP) and SAMOS (Shipboard Automated Meteorological and Oceanographic System)/COAPS (Center for Ocean-Atmospheric Prediction Studies) people working more closely together (Antoine Guichard and Shawn Smith)

# Enhancements Required

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- **Meteorology**
  - High quality ship obs (IMET on supply vessels)
  - Air-sea flux reference stations

# Satellites



**SMOS (Soil Moisture  
and Ocean Salinity)**

**Cryosat**



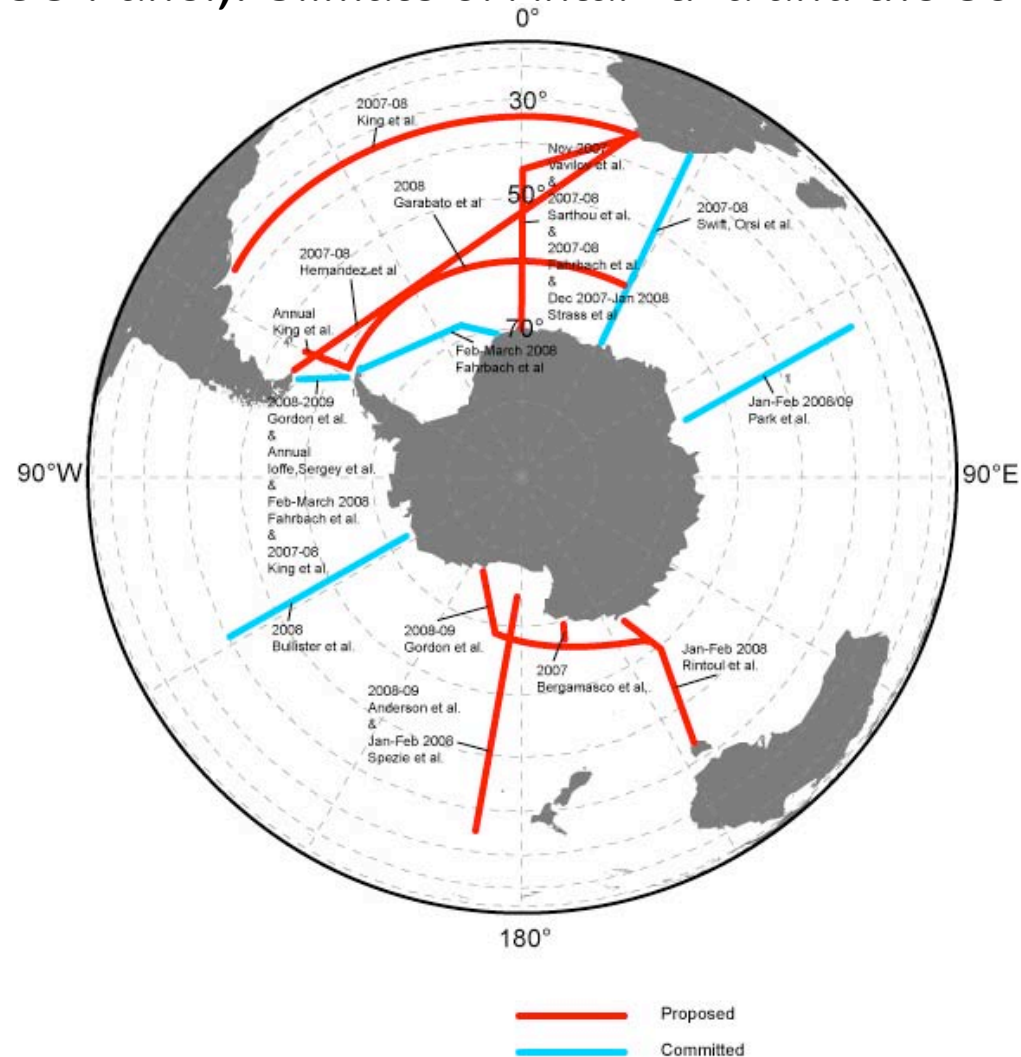
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- Meteorology
  - High quality ship obs (IMET on supply vessels)
  - Air-sea flux reference stations
- **Satellite data streams must be maintained.**
  - **Altimeter; gravity; ice; SST; wind**
  - **Replacement Cryosat has been approved (launch 2009)**

# International Polar Year (Mar. 2007-Mar. 2009)

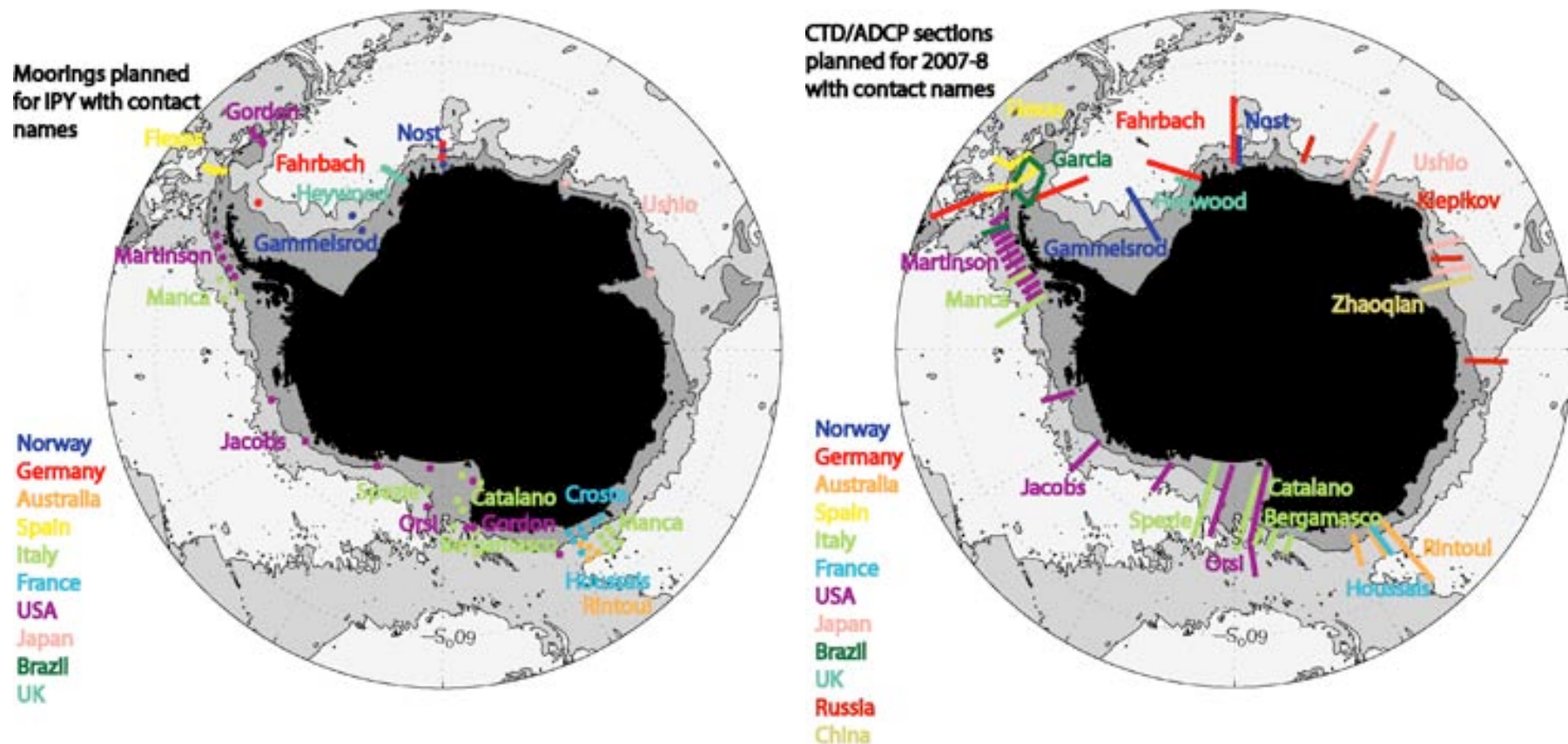
CASO (CLIVAR SO Panel): Climate of Antarctica and the Southern Ocean



CASO: <http://www.clivar.org/organization/southern/CASO/index.htm>

# International Polar Year (Mar. 2007-Mar. 2009)

## SASSI (iAnZone): Synoptic Antarctic Shelf-Slope Interaction Study



SASSI: <http://www.uea.ac.uk/~e280/sassi.html>

NB: Other chokepoints will be sampled by other programmes e.g. GEOTRACES

# Opportunities

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- *International Polar Year*
  - quasi-synoptic circumpolar survey
  - monitoring of Antarctic Slope Front
  - under-ice Argo
  - ice thickness and enhanced ice drifter array
  - proof of concept of a SO observing system
- *SO regional reanalysis project*
  - Present air-sea flux estimates are poor. More data should help, but often rejected by assimilation. Requires a dedicated regional reanalysis project.