China's Research of the Southern Ocean in past 10 years and future

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CLIVAR SOP Meeting, Hague, July 2014

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- **Education**
  - Physical Oceanography; 2000, Ph.D., IOCAS
- **Positions**
  - 2006- Professor, OUC; 2002-2005, Research Associate, FIO SOA;1992-2001 Research Assistant, IOCAS.
  - 2009- Member of Standing Scientific Group – Physical Science, SCAR
- **Oceanographic Cruises**
  - Southern Ocean: 2007/2008, 1994/1995, R/V *Xuelong*,
  - Arctic Ocean: 2010, 2003, R/V *Xuelong;* 2008, *USCG Healy;* 2006, R/V *CCGS Louis S. St-Laurent*
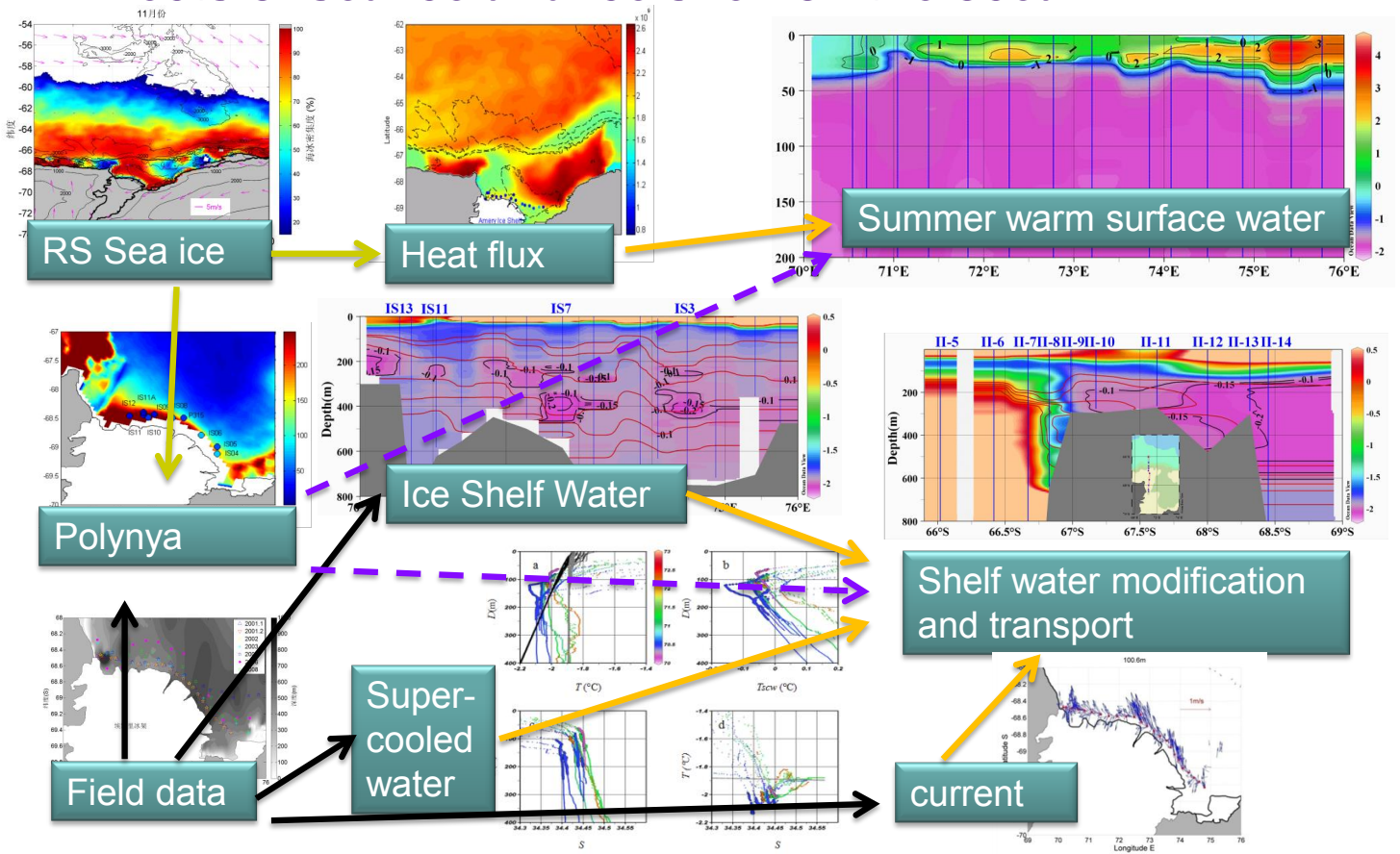- **Research Interests**
  - variations of watermasses and circulation in the polar oceans
  - ice-ocean interaction: polynyas, outflow water from the cavity under ice shelves.
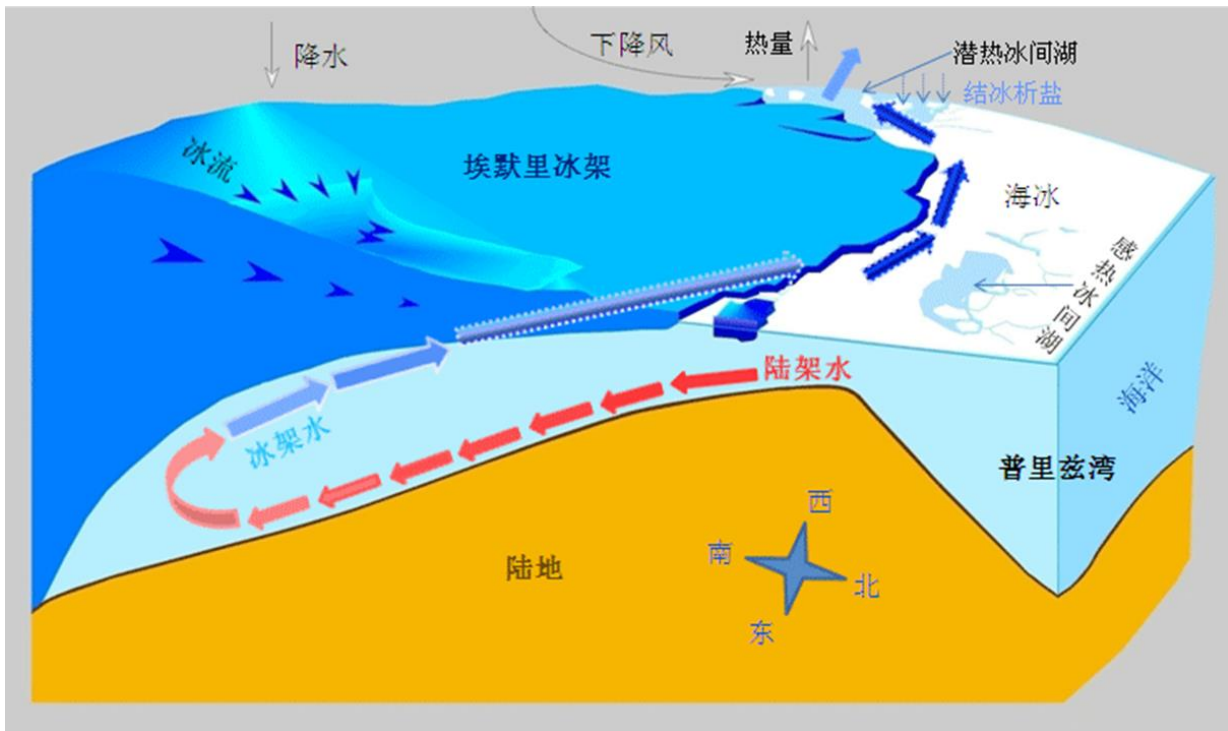
Recent research advances in Prydz Bay
Effects of sea ice and ice shelf on the ocean

RS Sea ice

Heat flux

Summer warm surface water

Polynya

Ice Shelf Water

Shelf water modification and transport

Field data

Super-cooled water

current

# Sea ice-polynya-ice shelf-ocean system in Prydz Bay

2004-2013

THE PAST 10 YEARS

research projects

- Nature Science Fund of China, e.g. 2002-2006, Key project of NSFC, Water masses, circulation and ocean-ice shelf interaction in Prydz Bay
- 2007-2010, Key Technologies R&D Program, Technology development for assessing and predicting the environmental variations in the Antarctica.
- 2010-2014, National Basic Research Program of China(973 Program), Variations of the coupled ocean-atmosphere system in the Southern Ocean and Indian Ocean and their influences on the climate of China
- 2011-2015, The first Chinese national research plan for polar region: Chinese Polar Environment Comprehensive Investigation and Assessment Programmes (CPECIAP)
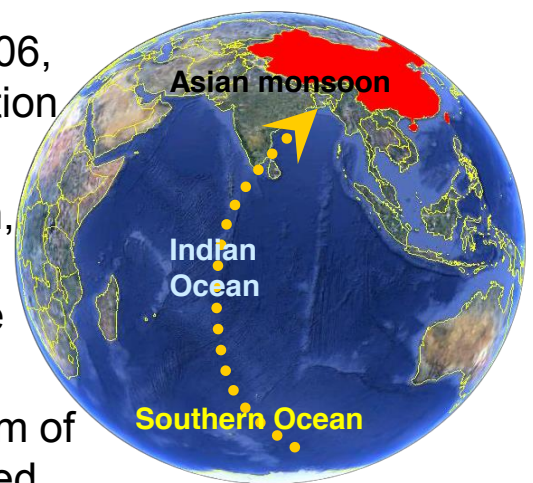
Cruises

- 1 ship to 1 station
  - Shanghai-Australia-Zhongshan(Prydz Bay, Indidan Sector)
- 1 ship to 2 stations
  - Shanghai-Australia-Zhongshan(Prydz Bay)-Great Wall(South Sheltland Islands, Drake Passage)
- Limited time for oceanographic station observations (~2 weeks in a half-year cruise)
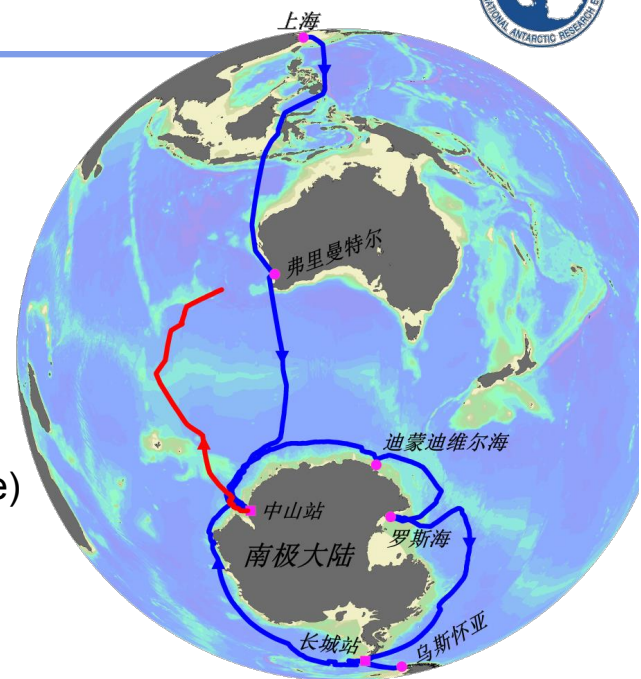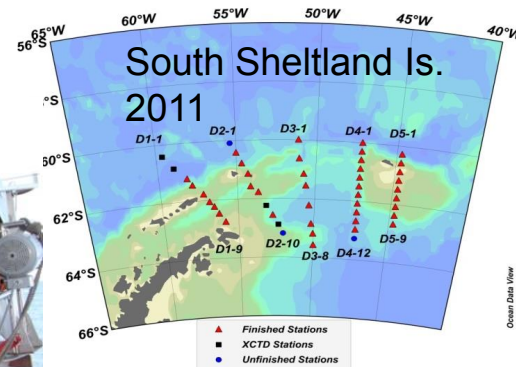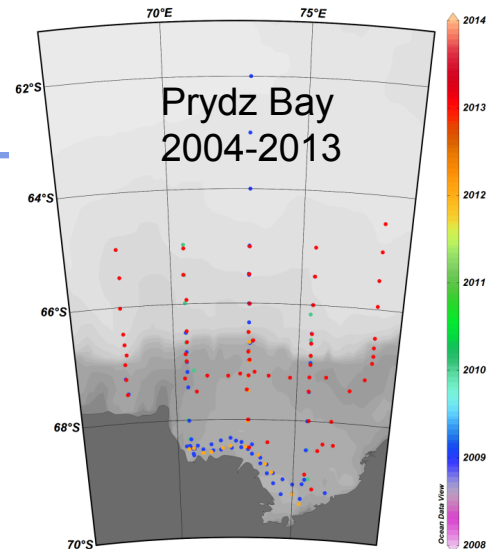

Cruise track of 30th CHINARE (2013/2014) with a cycle cruise around the Antarctica

Observations

- Oceangoraphic sections
  - CTD/LADCP, turbulence
  - Marine Chemistry, Biology, etc

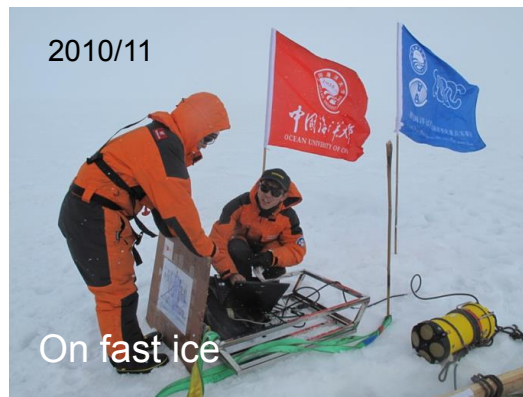- Underway observations for atmosphere, sea surface water and sea ice along the cruise tracks

2009/10
CTD, LADCP

2012/13
VMP
(Vertical Microstructure Profiler)

Prydz Bay
2004-2013

South Sheltland Is.
2011

Process experiments in Prydz Bay

2007/08
XCTD→Polynya

2010/11
On fast ice

Fast ice-ocean interaction: measure profiles of T/S and currents in the ocean under fast ice, radiations, meteorology .

Polynya process: Lauch XCTDs into a polynya in front of Amery Ice Shelf

Exchanges between shelf and basin: deploy moorings in the entrance of the bay.
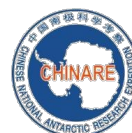

2013/14
Mooring

Research highlights

- Water mass and its variations in the region of Prydz Bay (AABW in basin, Sun et al., 2014)

- Outflow water from cavity under Amery Ice Shelf (Zheng et al., 2011; Shi et al., 2011)

- Diapycnal mixing in the Southern detected by high-resolution hydrographic profiles from Argo floats (Wu et al., 2011)
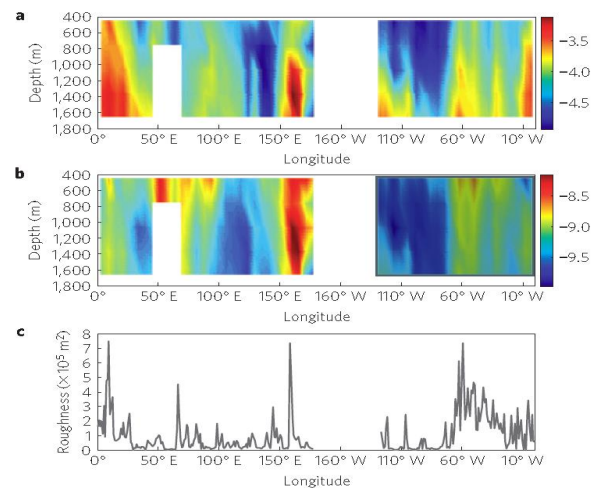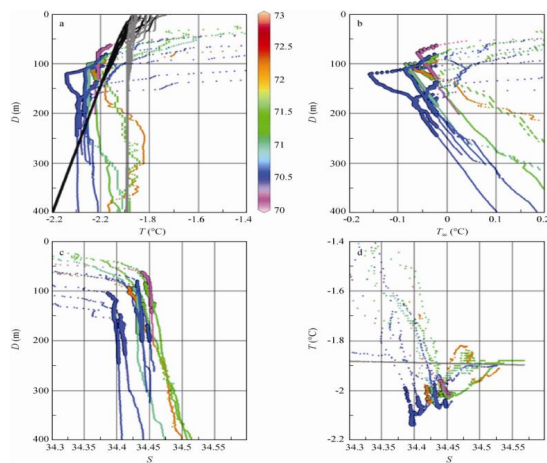
2016-2020

NEXT 5 YEARS

Research projects

- CPECIAP is hopeful to be extended to the second stage during 2016-2020, but has no any plan in details until now.
- A project for young scientists of the National Basic Research Program of China(973 Program) has been approved: Variability of the MOC in the ACC region and its impact on global climate change.
- Possible NSFC projects: ice shelf – ocean modeling, hot-water drilling on Amery Ice Shelf, etc
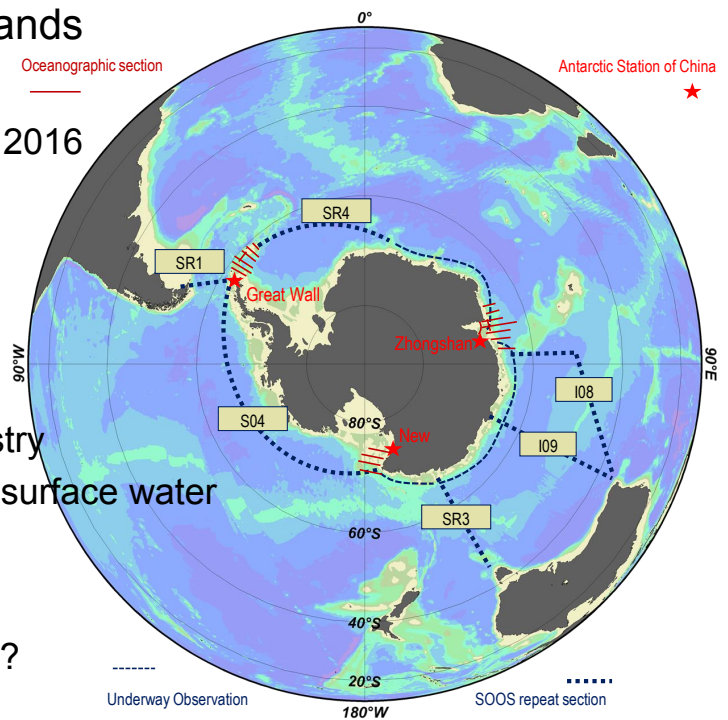- ……

Observations

- Oceanographic stations and sections
  - Prydz Bay, South Sheltland Islands
  - ACC regions?
    - If new icebreaker avaliable since 2016
  - Ross Sea?
    - If the 5th Chinese Station is built
- Underway observations
  - full cruise
    - meteorology, atmosphere chemistry
    - ADCP, T/S and chemistry of sea surface water
  - Expendable probes sections
    - XBT/XCTD, radiosonde
    - ~115° E, Drake Passage, others?
  - sea ice

Thanks!