

CLIVAR/CliC/SCAR Southern Ocean Region Panel SORP

National activities report

Country: China

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Receipt of material prior to 1 February 2019 will ensure inclusion discussions at the first SORP video conference for 2019. The reports contribute to future SORP discussions, as well as input to the SOOS and other CLIVAR/CliC/SCAR activities. All reports will be posted on the SORP website.

- Purpose of material gathered for the SORP:

To build an overview of observational, modeling, national projects and initiatives, ocean reanalysis and state estimation initiatives relevant to the SORP

(This can be detailed as a list of activities; maps showing where instruments have been or will be deployed; examples of modeling developments, experiments and set-ups; major national and international project involvement; etc.)

- Please refer to SORP's terms of reference (also given at the end of this template) for guidance on scope: <http://www.clivar.org/clivar-panels/southern>

Note: Biological topics such as marine ecology research, for example, are not within the scope of SORP's terms of reference and are therefore not required in these reports.

However, SOOS has an interest in such research, so National Representatives are encouraged to include summaries of such research as separate sections.

Note: The Southern Ocean is not explicitly defined in SORP's terms of reference, so please note what the limit used for your national report is (e.g., research on regions only beyond an oceanographic boundary like "south of the Polar Front", or research contained within latitudinal limits like "south of 50 °S").

Summary of National Activities

(Half page max. This section should include a succinct list of the main annual activities and breakthroughs as well as future plans (including any possible future opportunities for international collaboration))

The 34th Chinese National Antarctic Research Expedition (CHINARE43) was implemented during 22 October 2017 - 20 April 2018 aboard R/V Xuelong. Comprehensively oceanographic observations were conducted along 5 meridional sections in the region north of Amundsen Sea and 3 sections in Ross Sea. Moorings with CTD, current meters and sediment traps were deployed and recovered in Amundsen Sea and Prydz Bay. Underway measurements focus on surface water characteristics and upper layer currents were conducted along R/V Xuelong's cruise track. Extendable probes (XBT/XCTD/radiosonde) were launched when R/V Xuelong crossed the ACC. Oceanographic observations were also conducted in the region around South Shetland Islands when R/V Xiangyanghong I visited there during her global cruise. A workshop of the Southern Ocean modelling was held in China in order to bring together the SOOS modelling and scientific community and enhance collaboration with Chinese researchers. Although the Southern Ocean modelling community in China is relatively small, substantial progresses have been seen in recent years. An earth system model developed by the First Institute of Oceanography (FIO-ESM) had joined in the Sea Ice Prediction Network South (SIPN South) and submitted its forecast results of Antarctic sea ice area in summer 2018-2019. A coupled ocean-sea ice-ice shelf model was applied to study the intrusion of modified Circumpolar Deep Water in Prydz Bay.

A. Recent and ongoing activities

If your country has a national committee tasked with oversight of Southern Ocean climate science (e.g., like US CLIVAR), please give the name of the committee here:

Describe which major activities have been carried out in the last year or are in progress now. For each activity/project, provide a contact information (e.g., Principal Investigators and Associate Investigators), a website if available and a list of relevant publications.

1. Observational Activities

Main observational activities in CHINARE34 (2017/2018) are summarized as following:

- Hydrographic section

CTD/LADCP deployments and water samplings were conducted in Ross Sea (25-29 January 2018; Fig. 1), the region around South Shetland Islands (January - February 2017) and the region north of Amundsen Sea (2-23 March 2018; Fig. 2). Micro-structure profiler (VMP200) were deployed at some stations in the region north of Amundsen Sea (Fig. 2).

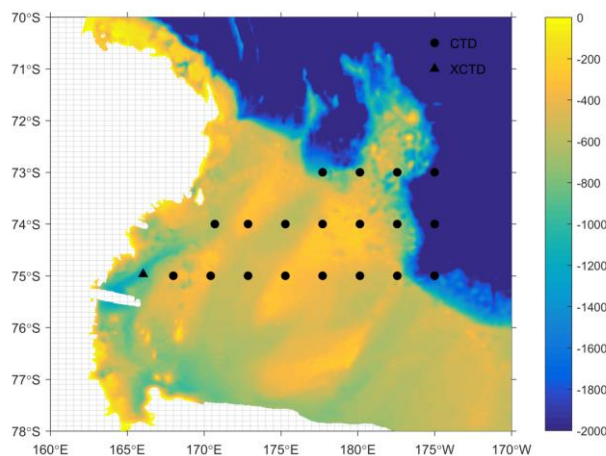


Fig. 1 CTD/LADCP stations in Ross Sea

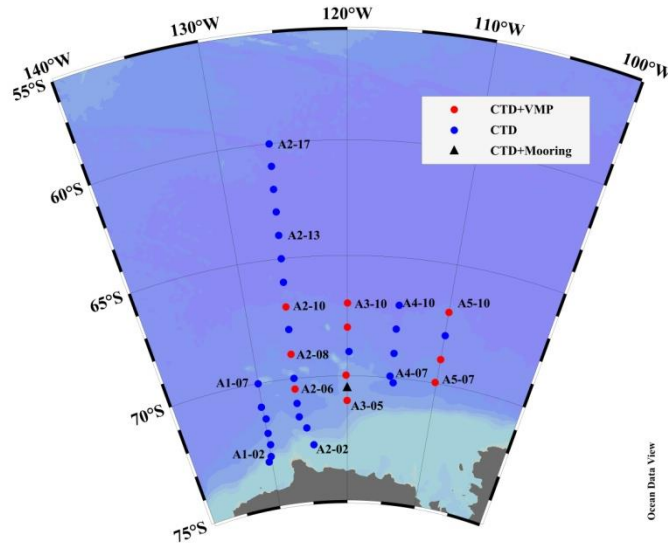


Fig. 2 Observing stations in the region north of Amundsen Sea

• Mooring

A mooring with CTD and sediment trap was deployed at AM01 in Amundsen Sea in March 2018 (Fig. 2). Moorings with CTD and current meters were recovered in Prydz Bay (Fig. 3), and nearly year-long records were collected at locations M10B (December 2016 - December 2017, with sediment trap) and MDP1 (March - December 2017). New moorings were deployed at locations M10C and MD1A in December 2017 (Fig. 3). Recovering of moorings M13A (deployed in February 2017) and M15 (deployed in March 2017) was given up due to heavy sea ice.

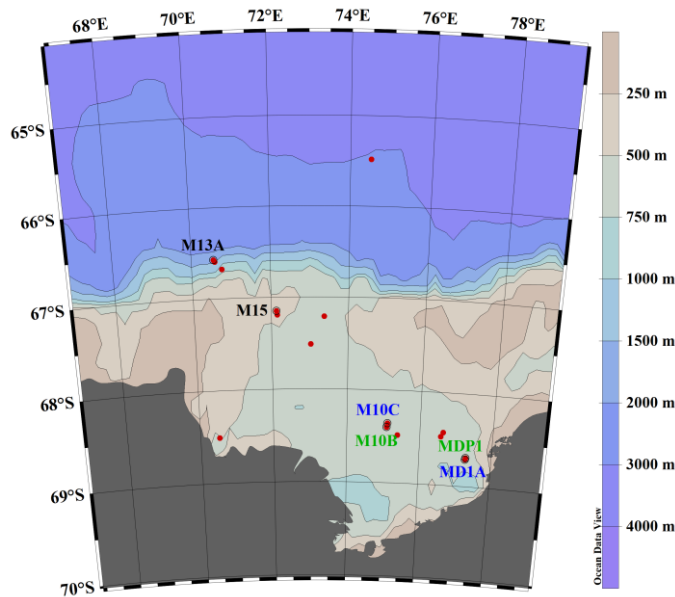


Fig. 3 Mooring locations in the region of Prydz Bay in CHINARE34
(Green: recovered, Blue: deployed, Black: not recovered, without name: previous location.)

- Expendable probes and floats

Expendable probes (XBT/XCTD, radiosonde) were launched along cruise track Prydz Bay - Ross Sea - New Zealand, and surface floats were deployed in Prydz Bay and Amundsen Sea (Fig. 4).

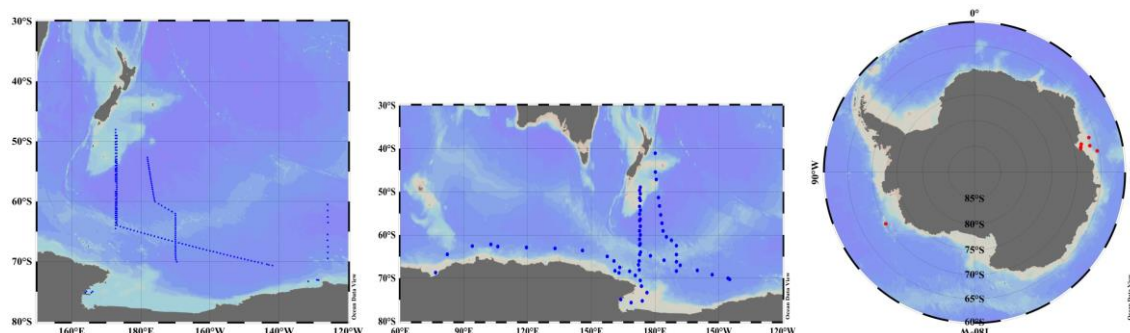


Fig. 4 Deploying locations of XBT/XCTD (left), radiosonde (middle) and floats (right)

- Underway observation

Temperature/salinity (measured by SBE 21) and chemistry (CO₂, etc) of sea surface water, meteorology, were measured along cruise track (Fig. 5).

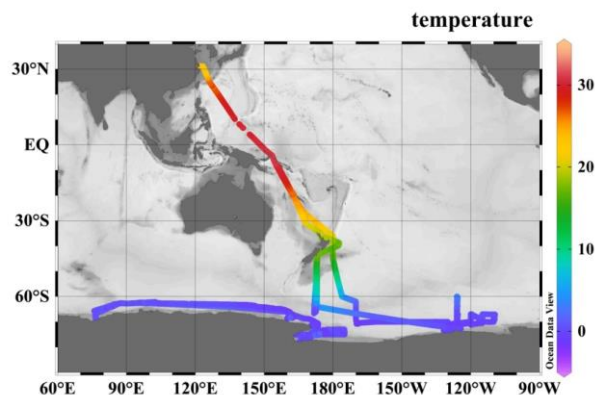


Fig. 5 Temperature measured along cruise track of CHINARE34

Contact information: (1) Region around South Shetland Islands: Libao Gao (gaolb@fio.org.cn), First Institute of Oceanography (FIO), State Oceanic Administration; (2) Region north of Amundsen Sea: Jiuxin Shi (shijiuxin@ouc.edu.cn), Ocean University of China (OUC); (3) Other regions: Guijun Guo (guoguijun@fio.org.cn), FIO.

2. Modeling Activities

- Workshop of Southern Ocean Modelling: Status and observational data requirements

A SOOS modelling workshop was held at the Second Institute of Oceanography (SIO), State Oceanic Administration (SOA), Hangzhou, China on 7-8 May 2018. The 36 participants included Earth System, polar and Southern Ocean modelers from China,

international observers and the SOOS Scientific Steering Committee. The aims of the workshop were to bring together the SOOS modelling and scientific community and enhance collaboration with Chinese researchers.

The Southern Ocean modelling community in China is relatively small at present; however China plans to expand the Southern Ocean and Arctic Ocean observing systems, and enhance modelling capabilities over the next decade. This workshop provided an opportunity for enhanced research collaboration between Chinese and the international Southern Ocean research community, and also an opportunity for polar synergies, in leveraging from Chinese Arctic research activities.

Reference: Mozloff et al., 2018. Southern Ocean Modelling: Status and observational data requirements. Workshop Report.

- A Chinese model joining in the Sea Ice Prediction Network South (SIPN South)

The results of Antarctic sea ice area (SIA) covering the period 1 December 2018 -28 February 2019 forecasted by FIO-ESM, an earth system model developed by FIO, were submitted to SIPN South, an international project endorsed by the Year of Polar Prediction (YOPP) in December, 2018. The forecast results from FIO-ESM and other 11 models will be used to make an initial assessment of the ability of current systems to predict Antarctic sea ice globally and regionally, with a focus on the summer season. A more detailed analysis of this summer 2018-2019 coordinated sea ice forecast experiment will be published in March 2019.

Contact information: Qi Shu (shuqi@fio.org.cn), FIO.

Reference: Massonnet et al., 2018. An initial outlook at the austral summer 2018-2019 sea-ice forecasts in the Southern Ocean.

- Coupled ocean-sea ice-ice shelf modelling in Prydz Bay

An eddy-resolving coupled regional ocean-sea ice-ice shelf model is employed to locate the hot spots where modified Circumpolar Deep Water (mCDW) intrudes onto the continental shelf within Prydz Bay, and locate the paths through which mCDW is transported to the Amery Ice Shelf (AIS) calving front. The mechanism responsible for mCDW upwelling over the Four Ladies Bank is also investigated with this model.

Contact information: Chengyan Liu, Zhaomin Wang (zhaomin.wang@hhu.edu.cn), Hohai University.

References: (1) Liu, C., et al., 2017. Modeling modified Circumpolar Deep Water intrusions onto the Prydz Bay continental shelf, East Antarctica. *Journal of Geophysical Research: Oceans*, 122(7): 5198-5217. (2) Liu, C., et al., 2018. On the Modified Circumpolar Deep Water Upwelling Over the Four Ladies Bank in Prydz Bay, East Antarctica. *Journal of Geophysical Research: Oceans*, doi: 10.1029/2018JC014026.

3. Ocean reanalysis and state estimation Activities

4. National and International Projects/Initiatives

B. Planned activities

List which major activities are planned or likely to occur during the next several years, together with a contact information (e.g., Principal Investigators and Associate Investigators).

1. Observational

The planned field works in Southern Ocean include:

- Hydrographic observation at transects in regions around Amundsen Sea, Prydz Bay and Ross Sea.
- Mooring deployment/recovery in Prydz Bay and Amundsen Sea.
- Underway observations along ship track (Hobart/Christchurch - Prydz Bay - Ross Sea - Hobart/Christchurch): current in upper ocean (38kHz/300kHz ADCP), temperature, salinity and chemistry (CO₂, etc.) of sea surface water, meteorology, sea ice(ASPeCt).
- Expendable probes (XBT/XCTD, radiosonde) observation at transects: Ross Sea - Hobart/Christchurch.
- Air-sea buoy, Argo floats and surface drifting floats might be released in the ACC and coastal regions.

2. Modeling

3. Ocean reanalysis and state estimation

4. National and International Projects/Initiatives

5. Opportunities for future international collaborations

CLIVAR/CliC/SCAR SORP terms of reference

(<http://www.clivar.org/clivar-panels/southern>)

"To serve as a forum for the discussion and communication of scientific advances in the understanding of climate variability and change in the Southern Ocean. To advise CLIVAR, [CliC](#), and [SCAR](#) on progress, achievements, new opportunities and impediments in internationally-coordinated Southern Ocean research."

Specific Activities:

1. Facilitate progress in the development of tools and methods required to assess climate variability, climate change and climate predictability of the ocean-atmosphere-ice system in the Southern Ocean.
2. Identify opportunities and coordinated strategies to implement these methods, spanning observations, models, experiments, and process studies.
3. Provide scientific and technical input into international research coordination, collaborating as required with other relevant programs, including the [Southern Ocean Observing System \(SOOS\)](#).
4. Monitor and evaluate progress in Southern Ocean research, and identify gaps.
5. Enhance interaction between the meteorology, oceanography, cryosphere, geology, biogeochemistry and paleoclimate communities with an interest in the climate of the Southern Ocean.
6. Work with relevant agencies on the standardization, distribution and archiving of Southern Ocean observations.