FARO meeting ASSW 2017
1 April Prague Czech Republic

Chinese Arctic Activities in 2016 & 2017

Huigen YANG
Polar Research Institute of China
1 April, 2016


Outlines：

- The 7th Chinese National Arctic Research Expedition (CHINARE-7)
- Infrastructure Development of CHINARE
- International Cooperation on Arctic Research
- Research Highlights

Outline of CHINARE-7

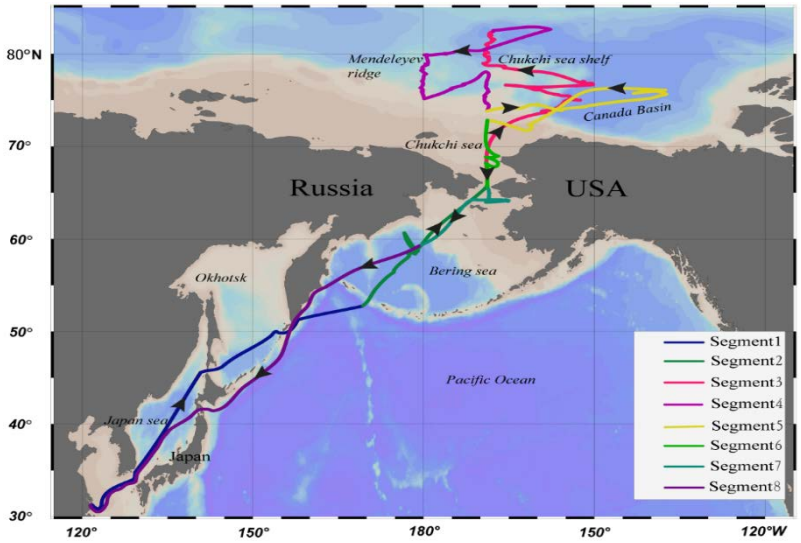
XueLong Arctic Cruise

78 Days

86 Scientists (2 French, 1 US)

77 Projects, including:

- Physical Oceanography
- Meteorology
- Sea-ice
- Marine Geology and Geophysics
- Marine Biochemistry
- Marine Ecology

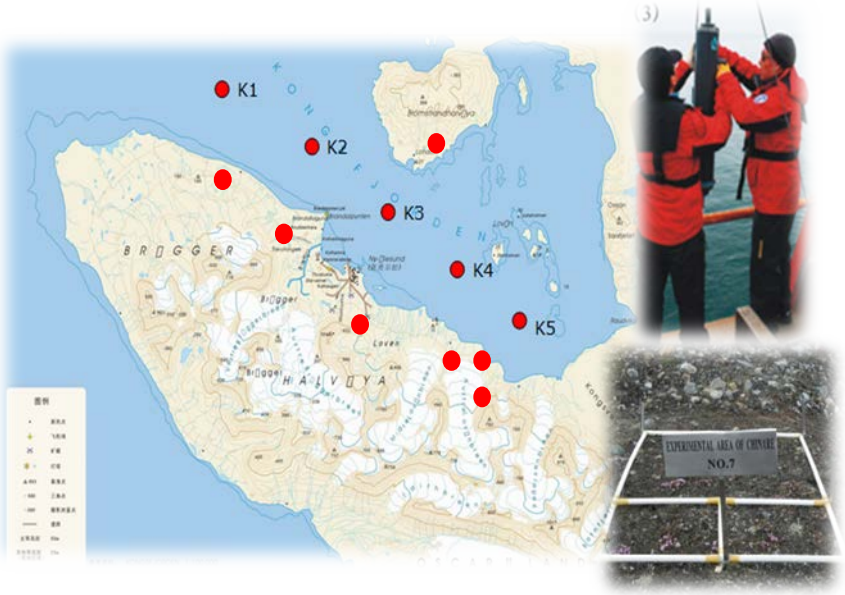


Yellow River Station

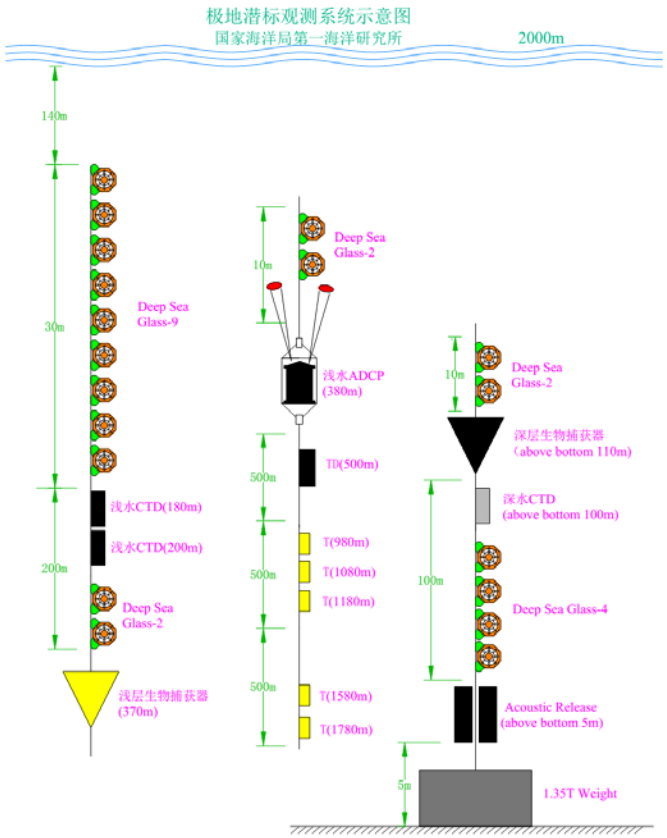
31 Scientists

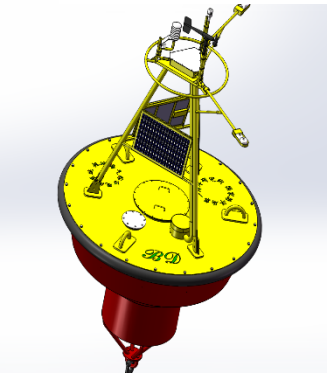
12 Projects, including:

- Glaciology
- Ecology
- Environmental Science
- Space Physics
- Atmosphere



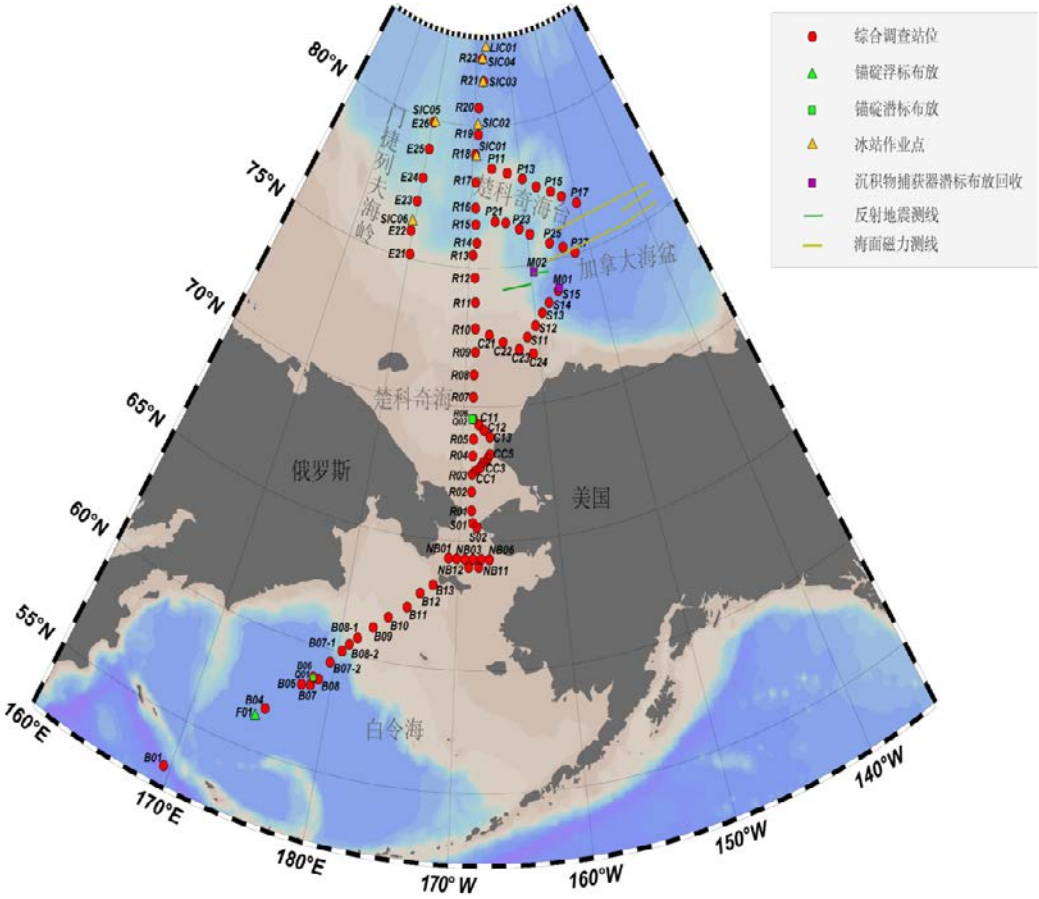
85 research stations of CHINARE-7





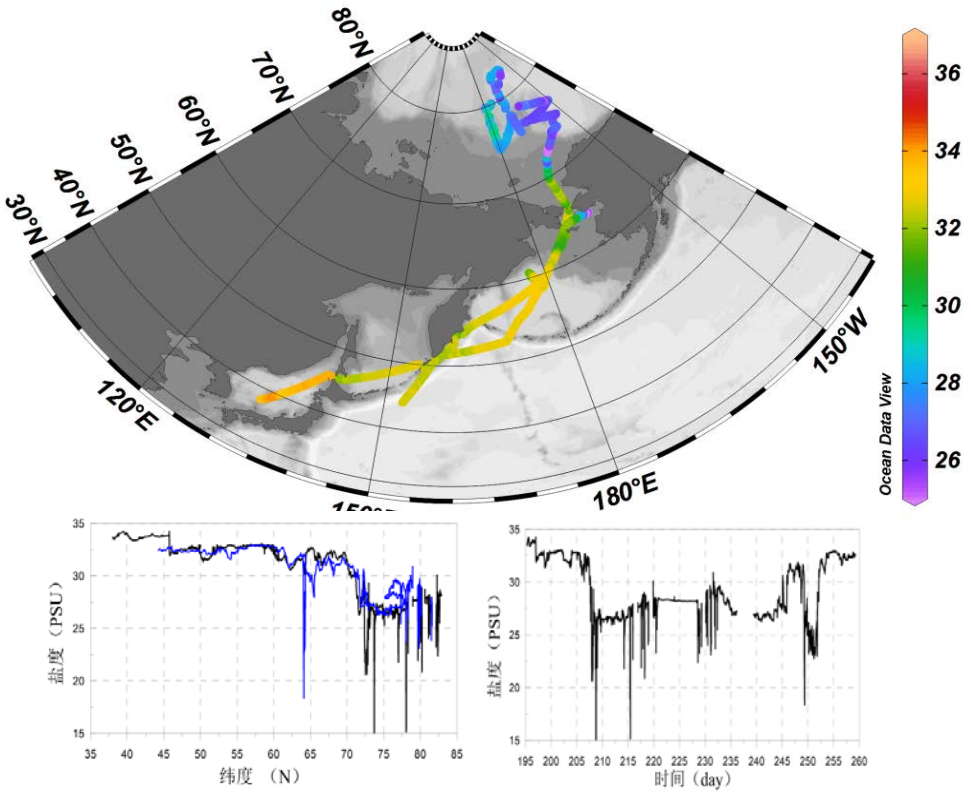
CTD stations

Mooring System

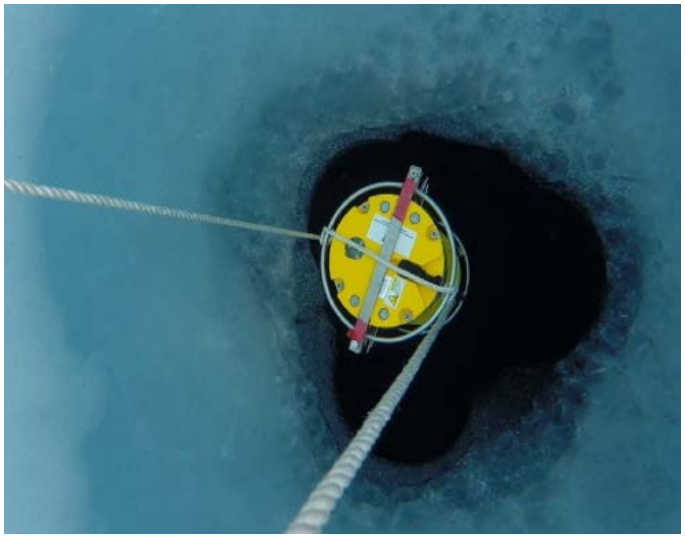


July 11th—Sept. 26th （ 78days）

Physical Oceanography Investigation



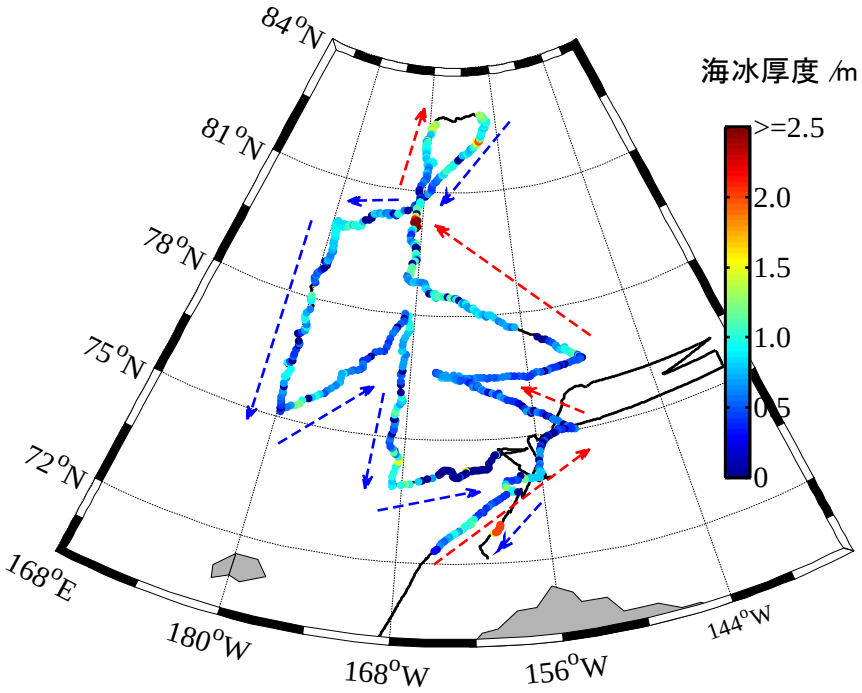
Spatial variation of temperature



ADCP for current velocity under the bottom of sea ice

Sea-ice Investigation

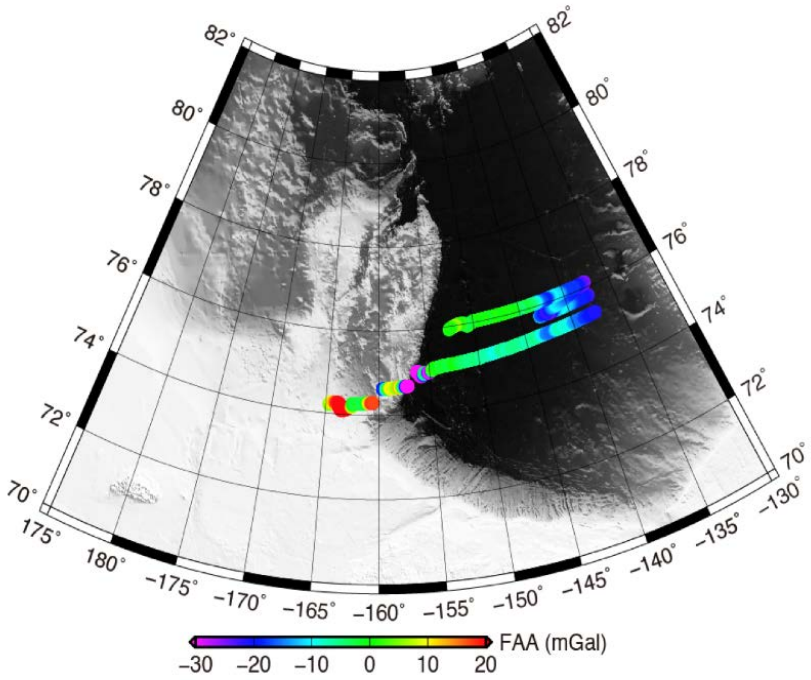
Photo by UAV



Distribution of sea ice thickness along the track

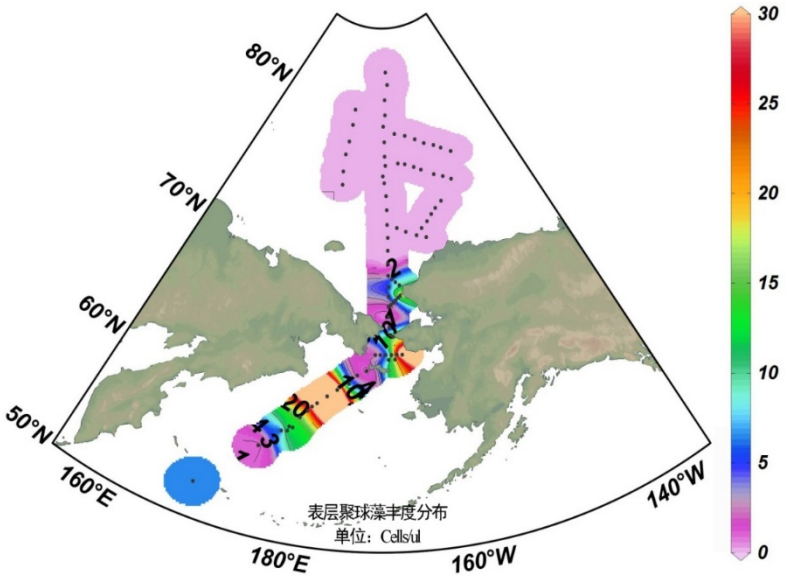
Geophysics Investigation

Comparison of thickness of the surface brown layer sediments

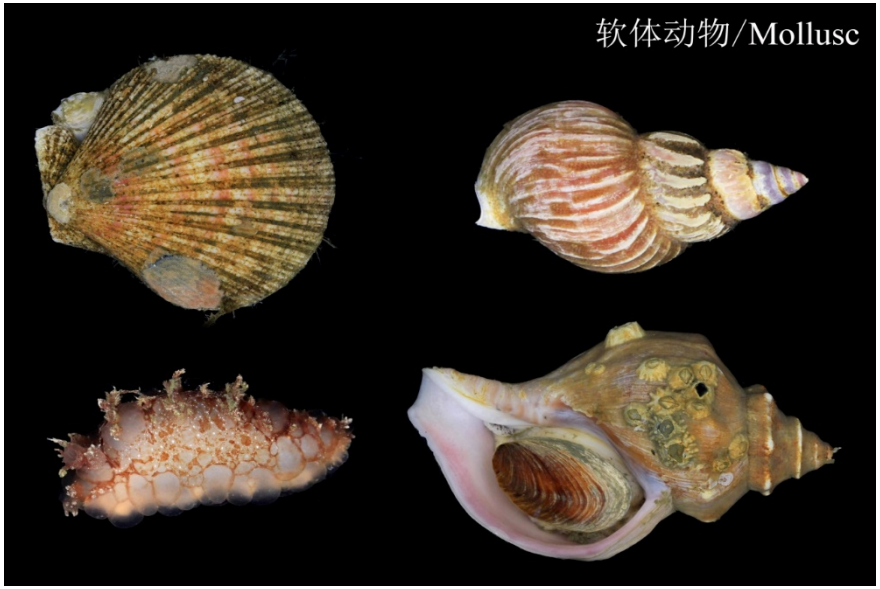


The FAA in Canada basin

Ecology Investigation



Surface distribution of *Synechococcus* abundance

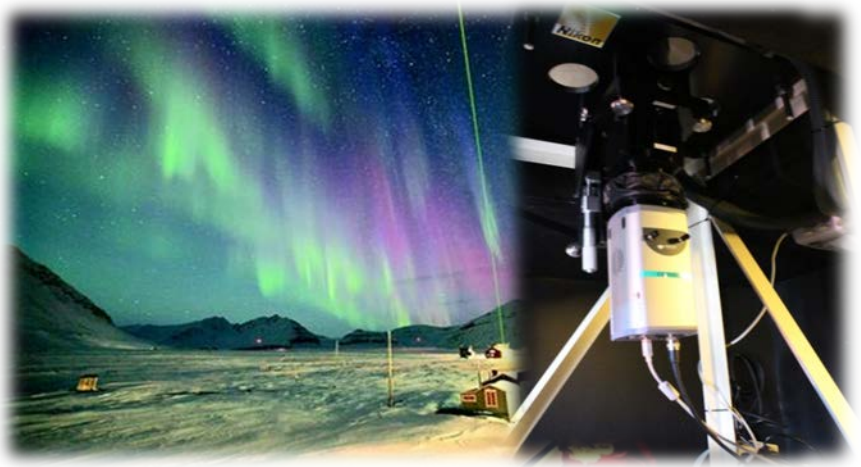


Projects in Yellow River Station in Ny-Ålesund 2016

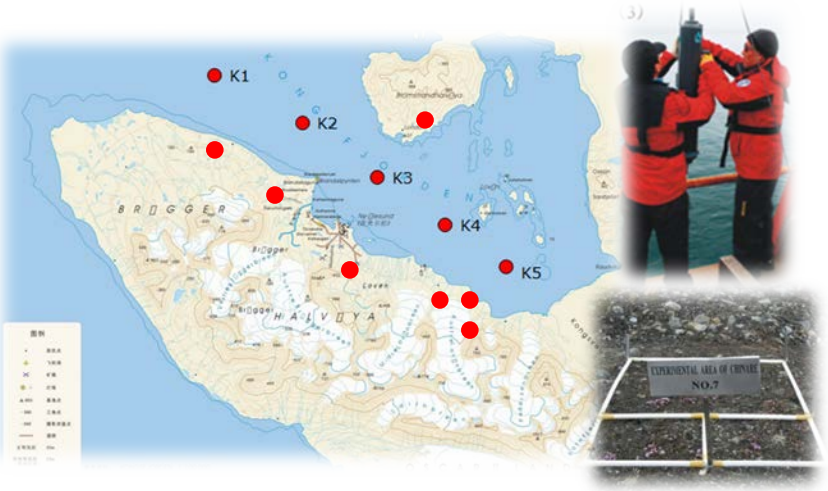
- **31 scientists**
- **12 projects**
- **5 groups (May, July, August, September, over-winter)**

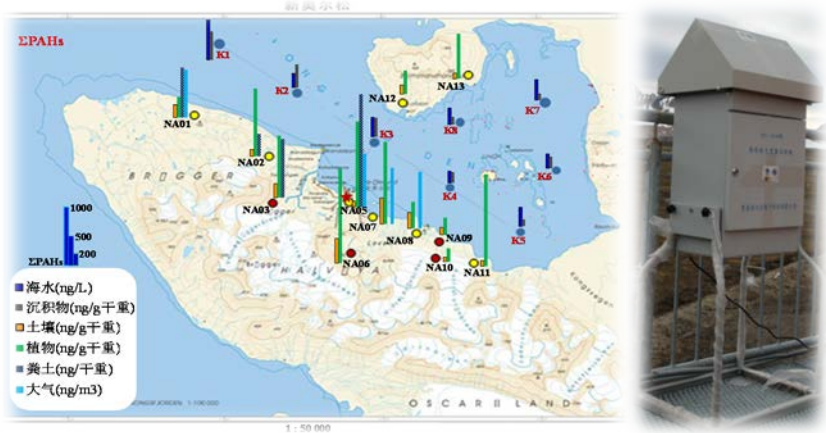
No.	Projects
1	Monitoring and studies of glaciers Austre Lovénbreen and Pedersenbreen, Ny-Ålesund, Svalbard
2	Maintenance of GNSS observation and monitoring of glaciers in Ny-Ålesund
3	Comprehensive continuous observations of glacier ice/snow radiation and ocean-atmosphere elements in Kongsfjorden
4	The biogeochemical characteristics of iron from aerosol and snow in Svalbard
5	Remote observation of tropospheric halogen oxides at Svalbard, Arctic
6	Investigation of ecosystem and environment in Ny-Ålesund
7	Investigation of fish plankton at Kongsfjorden
8	Study on the diversity of bacteria producing algal polysaccharide-degrading enzymes in the coastal areas of the Ny-Alesund
9	Aurora and Ionospheric observation at Yellow River Station
10	Investigation on the methylation and stable isotope fractionation of mercury in the Arctic
11	Study on the lichen biodiversity in plant monitoring quadrats of Ny-Alesund
12	Monitoring and studies of glaciers Austre Lovénbreen and Pedersenbreen, Ny-Ålesund, Svalbard

China’s research in Ny-Ålesund



Space physics @Ionosphere observation Climate change @ atmosphere & glacier observatio





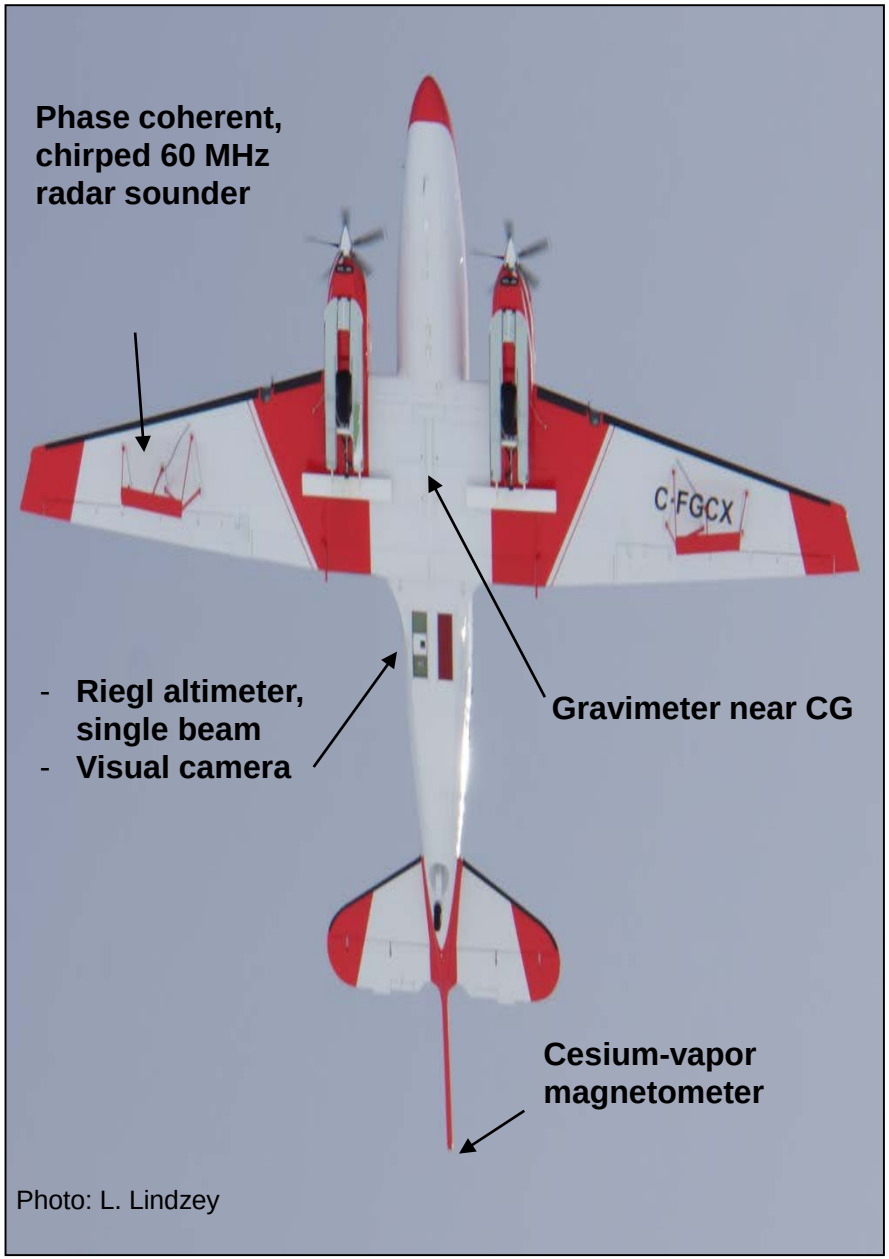
Terrestrial & marine ecology observation

Pollutants & locality environment observation

Infrastructure Development of CHINARE

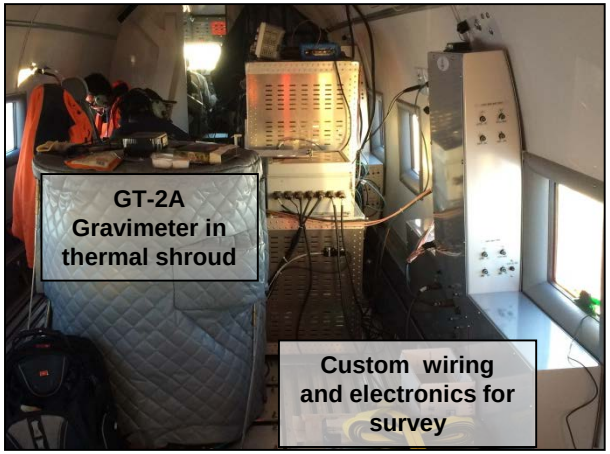
3. CHINARE Research Plane ：SNOW EAGLE 601

Snow Eagle 601 airborne investigation platform



GPS antennae forward and above aircraft CG

GPS antennae on wings



Icebreaker under construction

- **Displacement of 14,000 tons, 20,000 nm endurance, self-sustaining for 60 days**
- **Ice breaking capability of 1.5m sea ice plus 0.2m snow, at speed of 2 to 3 knots**
- **Hydrographic, chemical , biological, geological and geophysical investigation**

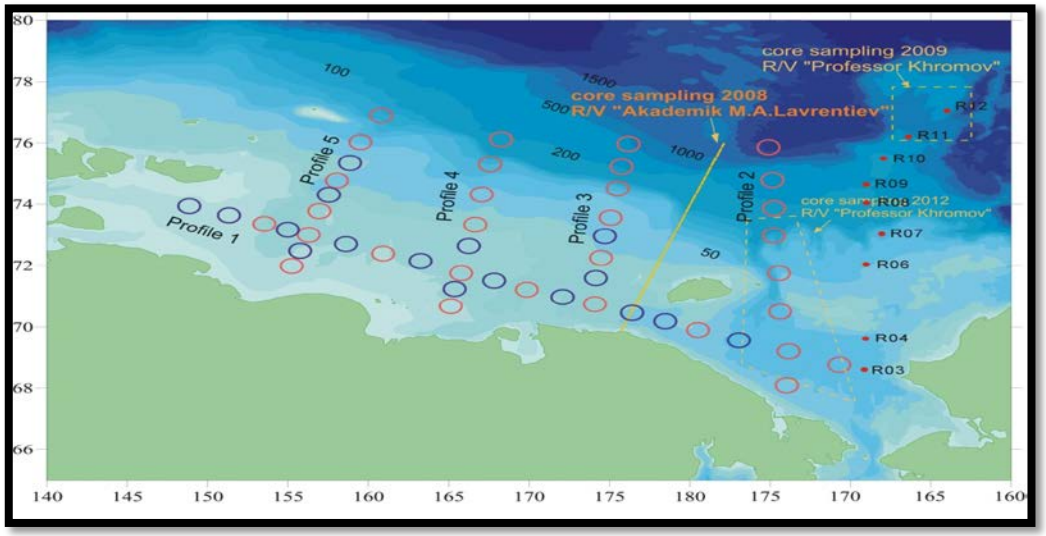
0n 20 Dec 2016, the New icebreaker initiated its construction

New icebreaker will be delivered in March 2019

International Cooperation on Arctic Research

1st China-Russia Joint Arctic Research Expedition (18 Aug.~20 Sept.) 2016

Akademik M.A.Lavrentyev



Objectives:

In order to discover the millennial-centennial environment and climate changes in the Arctic region:

- **to retrieve sedimentation cores from the Chukchi and East Siberian Seas**
- **to observe the sea ice evolution and productivity of the water column for paleoceanography reconstruction**

Investigations:

- **Marine geology**
- **Oceanography**
- **Marine biology**
- **Marine chemistry**
- **atmospheric chemistry**

11 people from China in total

Marine geology: 3

Physical Oceanography: 2

Marine Chemistry: 3

marine organism: 3

- Polar Research Institute of China
- The First Institute of Oceanography , SOA
- The Second Institute of Oceanography , SOA
- The Third Institute of Oceanography , SOA
- Ocean University of China
- Xiamen University

19 people from Russia in total

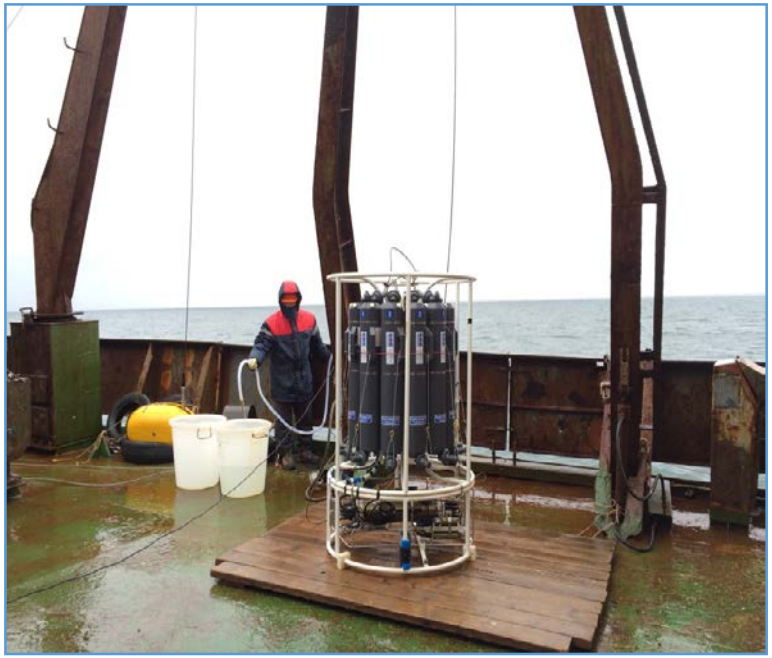
Marine geology: 14

Physical Oceanography: 1

Marine Chemistry: 2

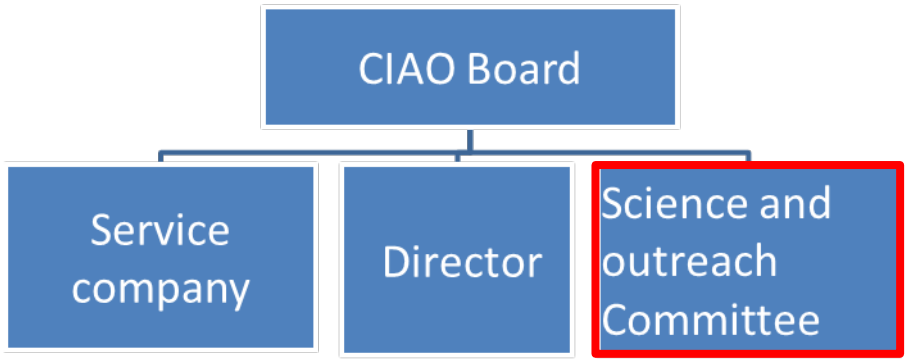
marine organism: 2

- Institute of the Pacific Ocean, Russian Academy of Sciences



China-Iceland Joint Aurora Observatory (CIAO)

CIAO with magnetic latitude of 66° , is well located under the earth magnetosphere's plasmasheet and ideal to observe nightside aurora.



Icelandic institutes:

Arctic Portal
Husavik Academic Center
The Icelandic Centre for Research(RANNIS)
Icelandic Meteorological Office (IMO)
Science Institute, University of Iceland
University of Akureyri
Icelandic Arctic Cooperation Network

Chinese institutes:

Polar Research Institute of China
National Space Science Center, CAS
Institute of Geology and Geophysics, CAS
China Research Institute of Radio Propagation
National Center for Space Weather, CMA
Peking University
Wuhan University
University of Science and Technology of China
Shandong University

China-Iceland Joint Aurora Observatory (CIAO) Construction

New Aurora Observatory under construction（started from May 2015）

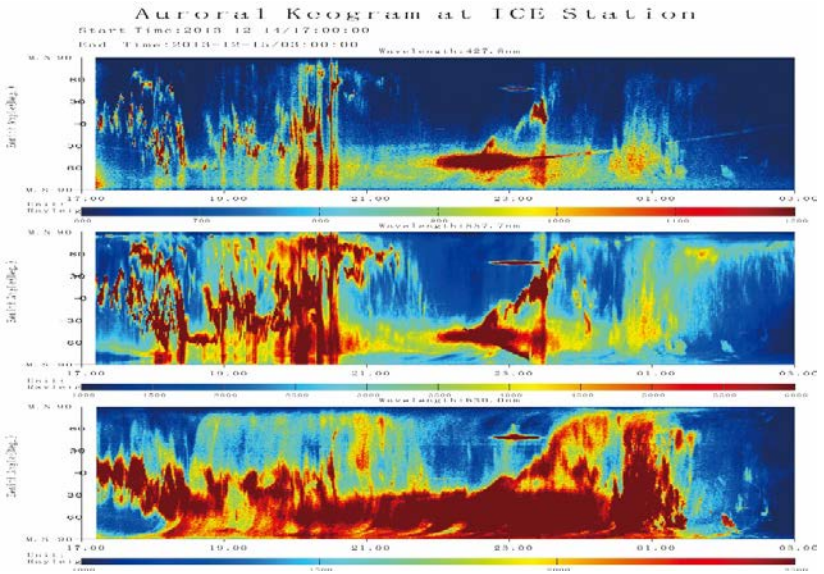
New Aurora Observatory under construction（Jan, 2016）

✓ **Opening on October 2017**

Scientific Observation of China-Iceland Joint Aurora Observatory

Multiple-wavelength All-sky Imager

Running from Oct. 2013



The China-Nordic Arctic Research Center (CNARC)

Purpose

- To increase awareness, understanding and knowledge of the Arctic and its global impacts
- To promote cooperation for sustainable development of the Nordic Arctic and coherent development of China in a global context

Activities

- China-Nordic Arctic Cooperation Symposium
- CNARC Fellowship / Internship Program
- CNARC Publication Program
- Joint Research Project

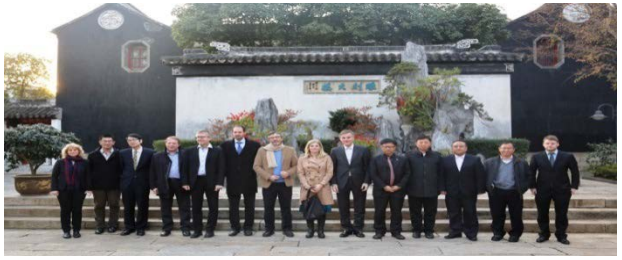
Member institutes

- Nordic

- Arctic Center, University of Lapland (Finland)
- Fridtjof Nansen Institute (Norway)
- Icelandic Centre of Research
- Nordic Institute of Asian Studies (Denmark)
- Norwegian Polar Institute;
- Swedish Polar Research Secretariat

-China

- Polar Research Institute of China
- Shanghai Institutes for International Studies
- Tongji University
- Ocean University of China
- Shanghai Jiao Tong University



CNARC activities in 2016

- ✓ - Organization of 4th China-Nordic Arctic Cooperation Symposium – *The Sustainable Arctic – Opportunities and Challenges of Globalization* in Rovaniemi, Finland on 6-9 June with nearly 100 participants
- ✓ - Organization of Economic Roundtable on Arctic Sustainable Tourism in Rovaniemi on 9 June
- ✓ - Sponsorship of Fellowship: 2 fellows from China and 3 fellows from Nordic states conducting the fellowship for a total duration of 6 months
- ✓ - Journal Publication: Special Issue on Arctic Policy and Sustainable Development published on *Advances in Polar Sciences*

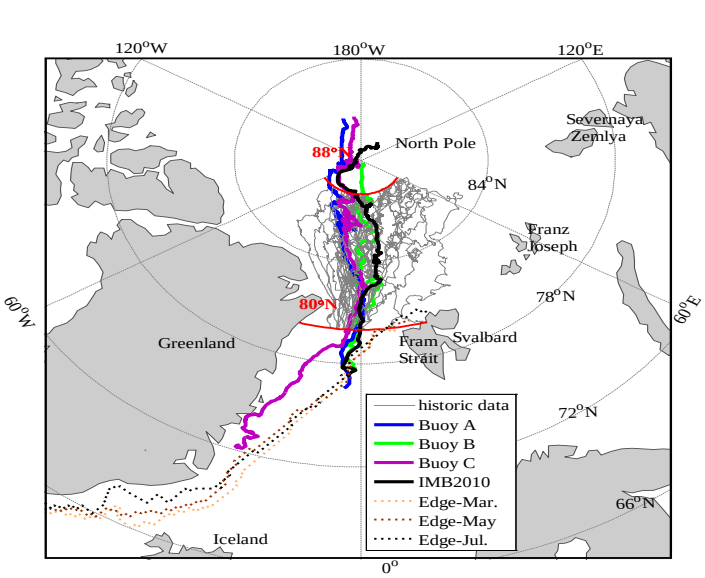
4th China-Nordic Arctic Cooperation Symposium, Rovaniemi

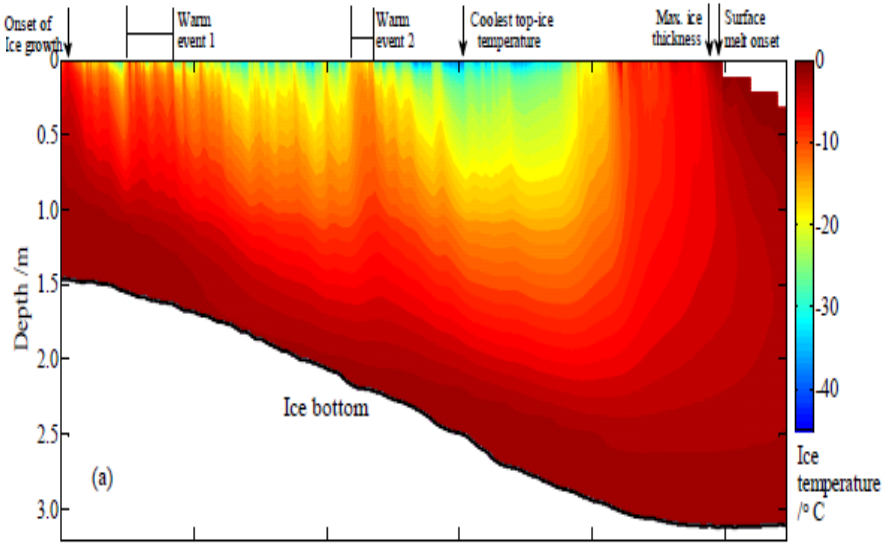
Upcoming Event in 2017:

- ➢ The 5th China-Nordic Arctic Research Center (CNARC) - *Towards the Future: Trans-regional Cooperation in the Arctic Development and Protection*
- ➢ CNARC Economic Roundtable - *Arctic Shipping and Port Cities*

Research Highlights

Buoy observation of Arctic sea-ice rapid change



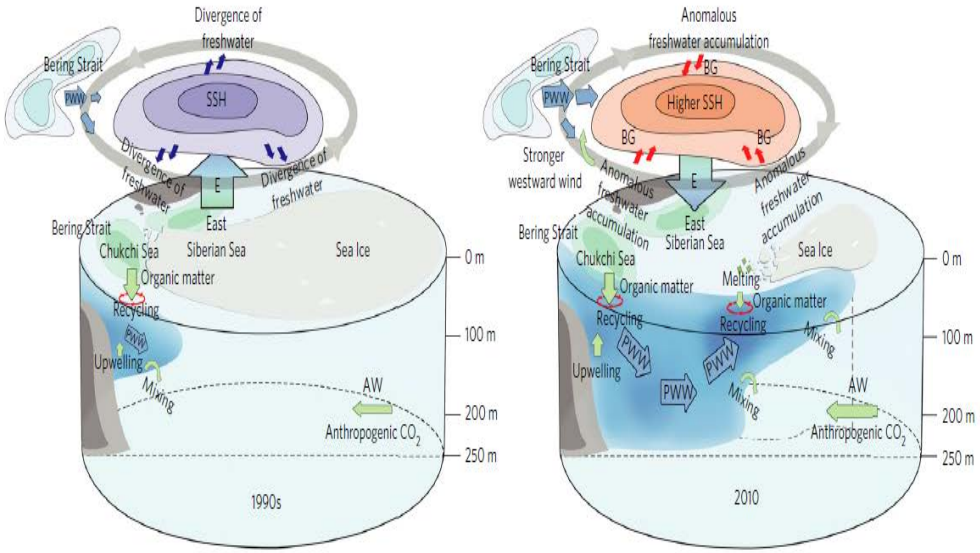


Ice-mass-balance buoys on sea ice growth and drift deployed in Central Arctic Ocean.

Sea ice loss in summer lead to increase of under-ice oceanic heat flux in fall and early winter, which may result in further retreat of Arctic sea ice extent in next summer.

Lei et al., 2014, JGR ; Lei et al., 2015, CRST

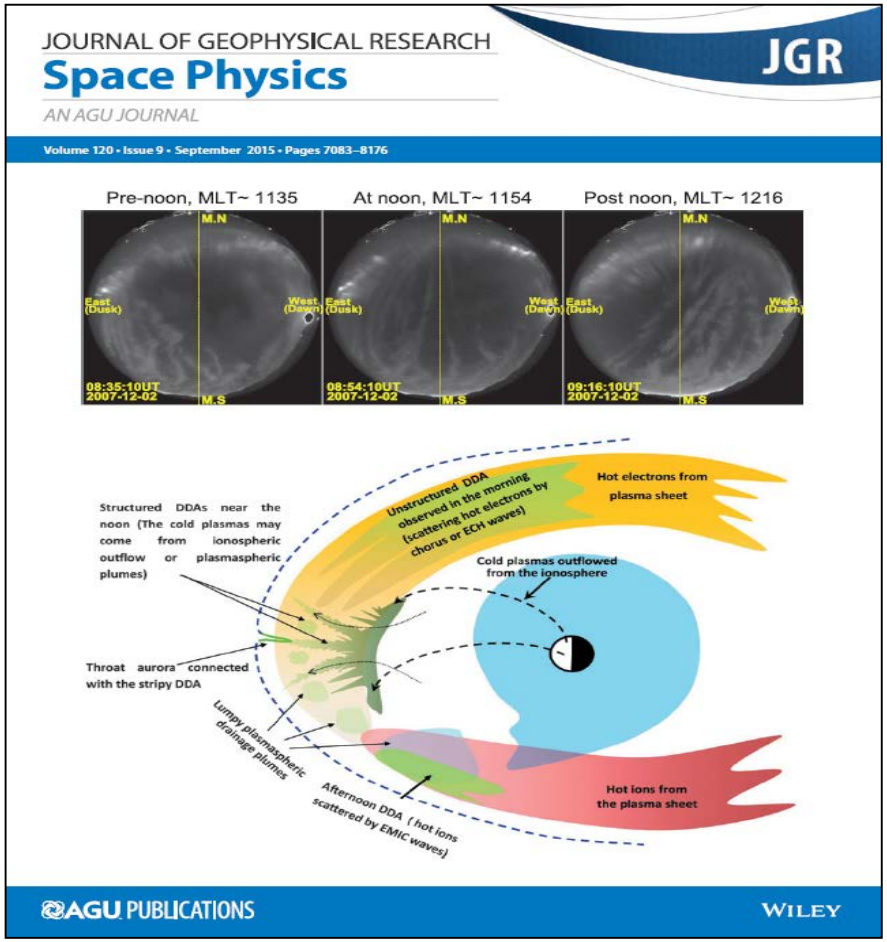
Acidification of the Arctic ocean



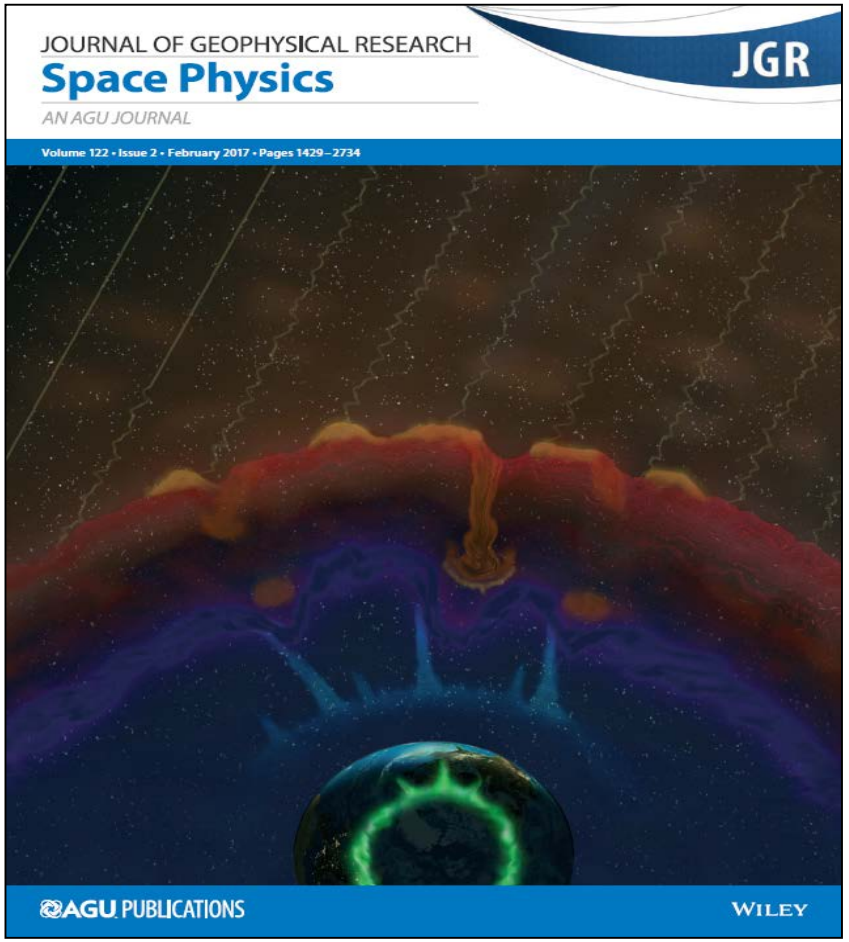
Ocean Acidification can be detrimental to marine organisms and ecosystems. CHINARE found that more rapid acidification is occurring in the Arctic Ocean, especially in the western Arctic Ocean, than the Pacific and Atlantic oceans. Increased Pacific Winter Water transport, driven by an anomalous circulation pattern and sea-ice retreat, is primarily responsible for the expansion, although local carbon recycling and anthropogenic CO2 uptake have also contributed.

Di Qi and Liqi Chen et al, Nature Climate Change, 2017.

New aurora features



Dayside diffuse aurora : ionospheric signature of magnetospheric dynamics



Throat aurora: ionospheric signature of magnetosheath transients

Han et al., JGR 2015; Han et al., 2017


•THANKS!