

INTERNATIONAL SCIENCE AND POLICY CONFERENCE
**THE ECOSYSTEM APPROACH TO MANAGEMENT:
STATUS OF IMPLEMENTATION IN THE ARCTIC**
23-25 AUGUST 2016
FAIRBANKS - ALASKA



CO-CONVENERS:
PAME
Protection of the Arctic Marine Environment

CAFF
Conservation of Arctic Flora and Fauna



Spatial Distribution of Sea-surface Chlorophyll *a* from Bering Sea to Chukchi Sea and Impact Factors Analysis During Summer of 2014



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Chinese National Arctic and Antarctic Data Center

August 24, 2016, Fairbanks-Alaska, USA

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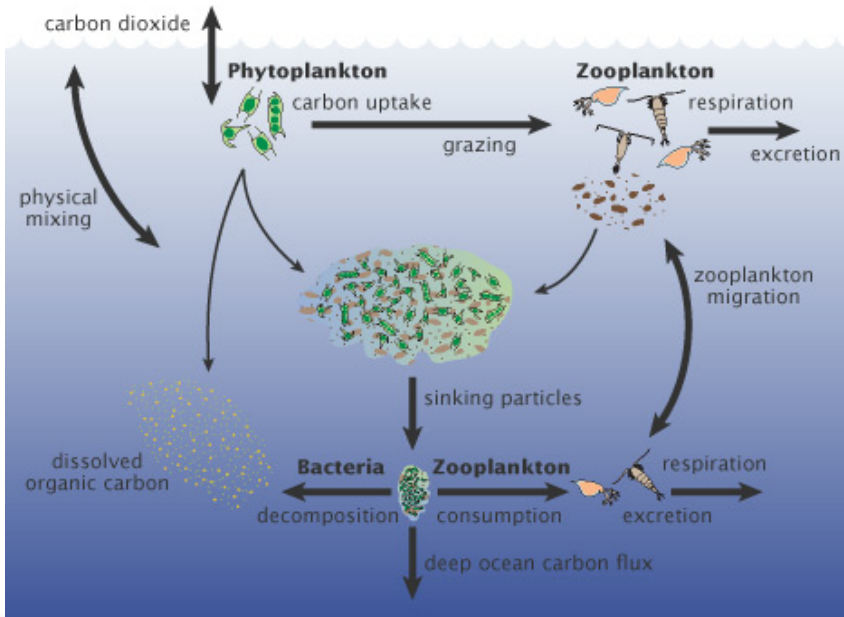
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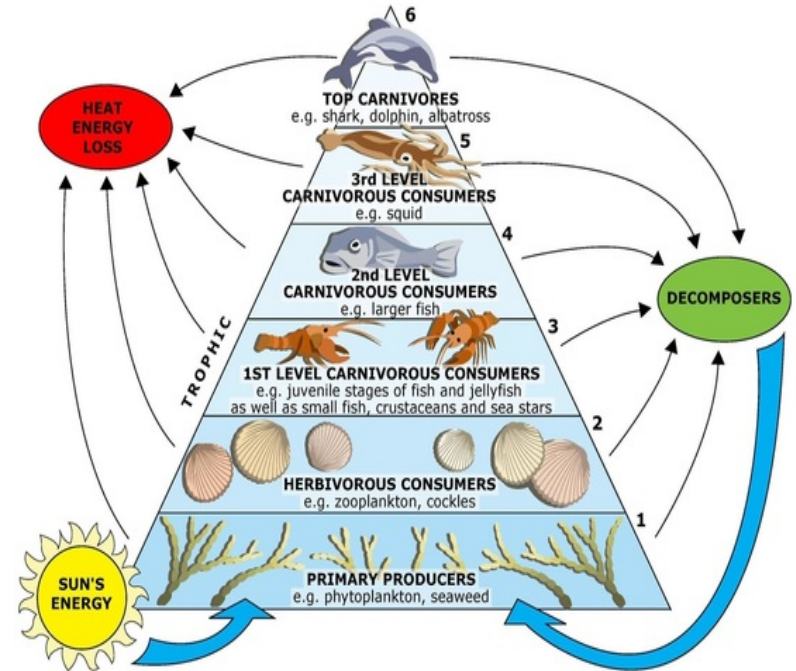
Background introduction

1. Phytoplankton and Carbon Uptake

As basis of marine ecosystem, photosynthetic plankton take on more than 90% organic matter production in oceans. Through adjusting CO₂ water-gas balance, they play an important role in global carbon cycle and climate change.



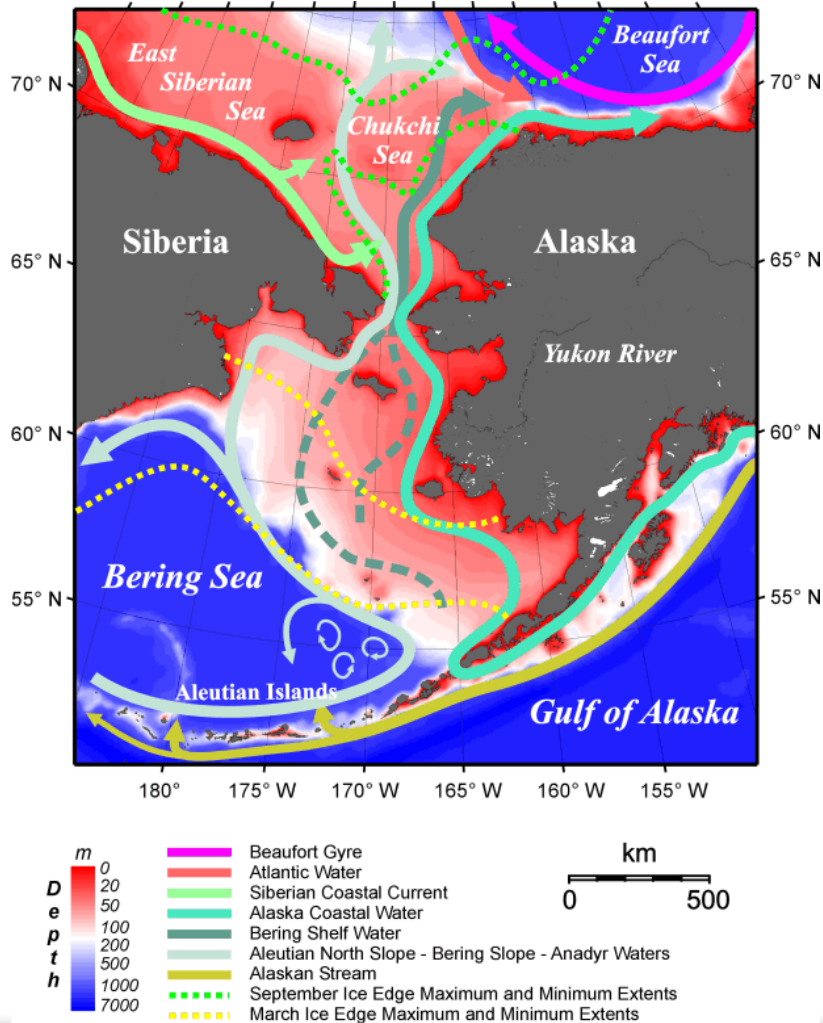
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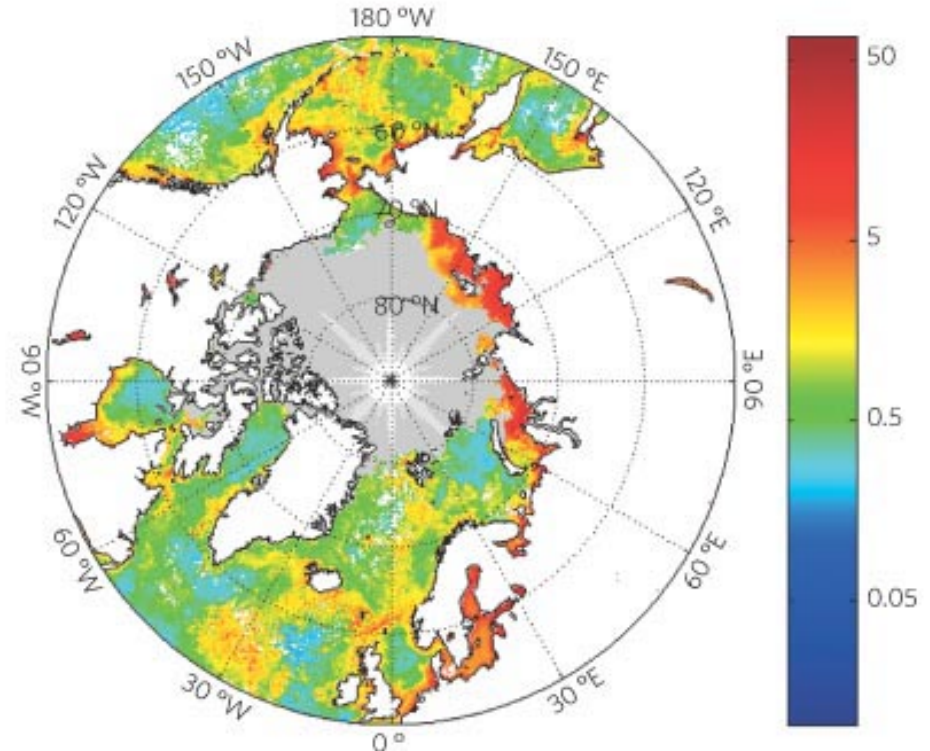
Chlorophyll content in seawater could reflect phytoplankton standing crop, so research on chlorophyll content in Arctic Ocean could play important basic role for global carbon cycle and climate change research. 3

Background introduction

2. Ocean Currents and Mass Transportation

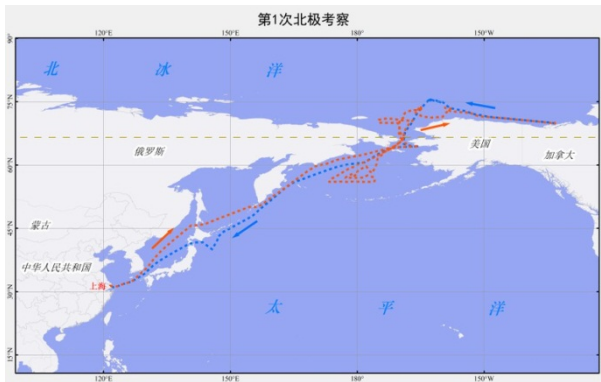


Bering Sea to Chukchi Sea is one of the most productive marginal sea in Arctic Ocean, it is also an important channel for North Pacific Ocean conveying ocean circulation to Arctic Ocean.

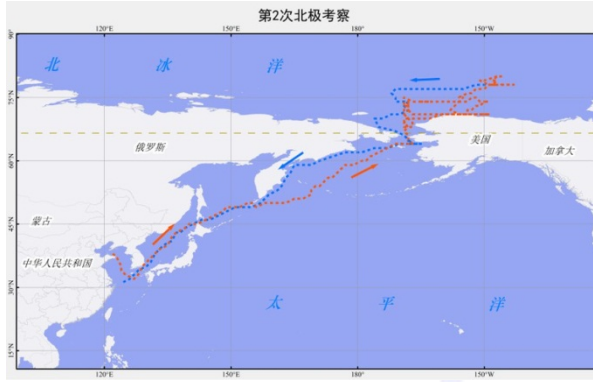


Background introduction

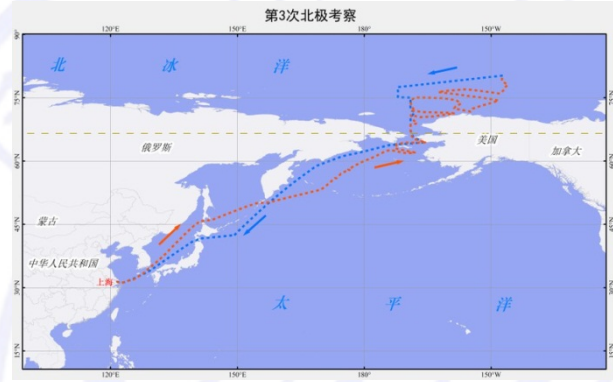
3. China Arctic Scientific Research Cruises



1st



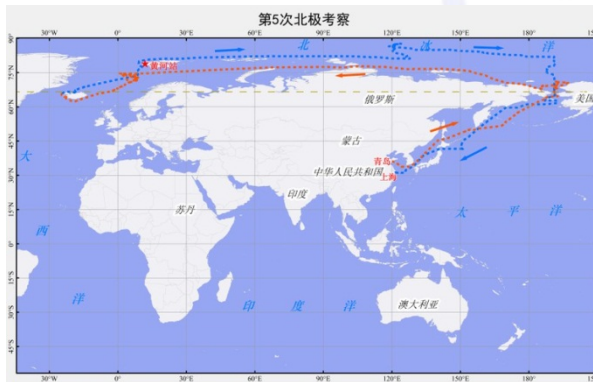
2nd



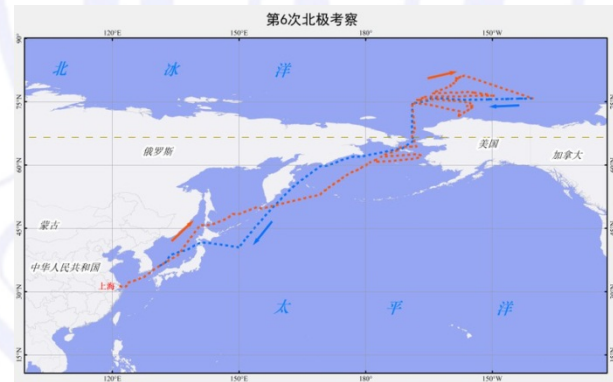
3rd



4th



5th



6th Arctic in July-September
2014

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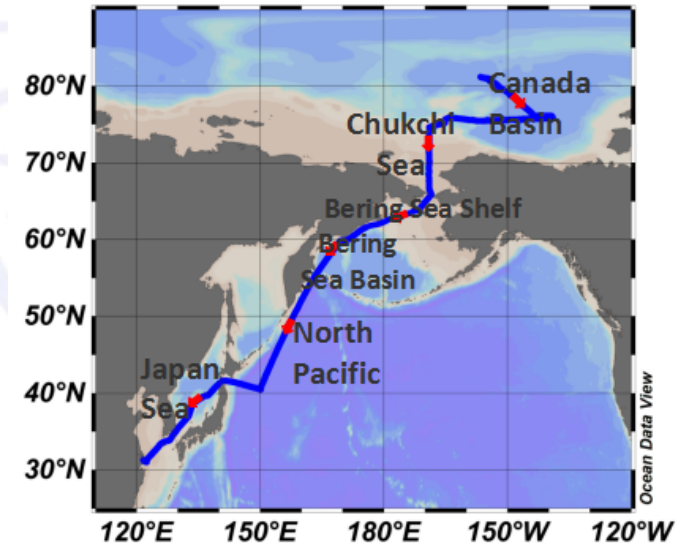
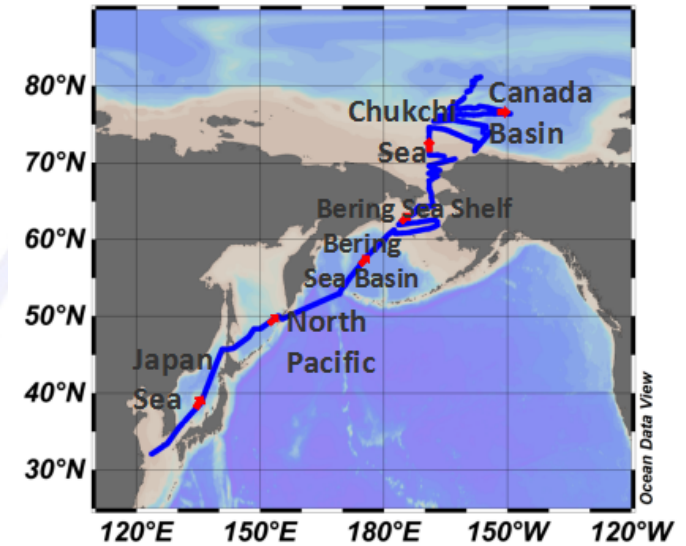
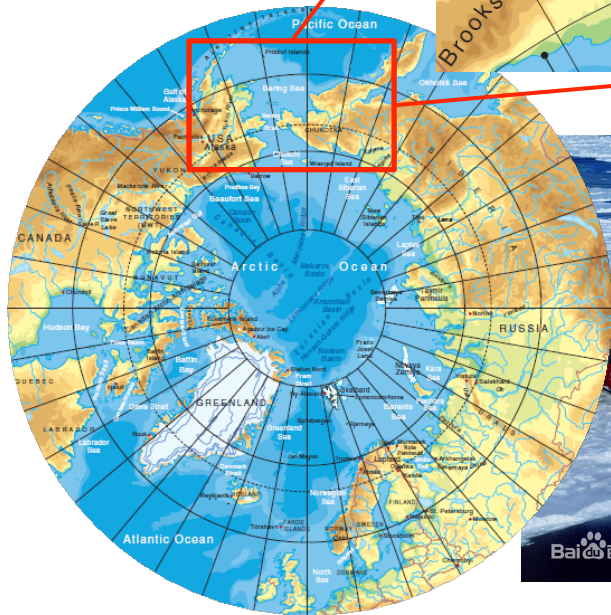
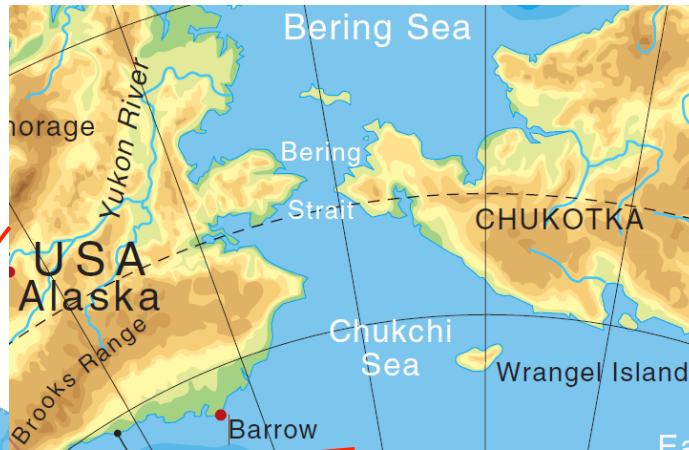
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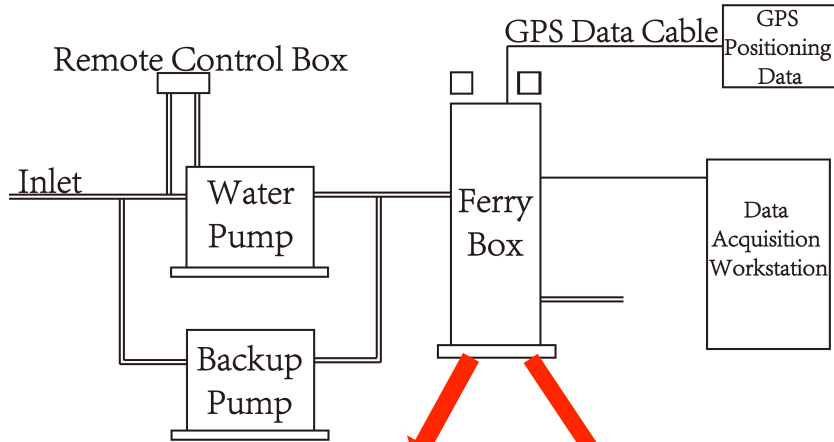
Study area & research method

1. Study Area and RV XUELONG Cruise



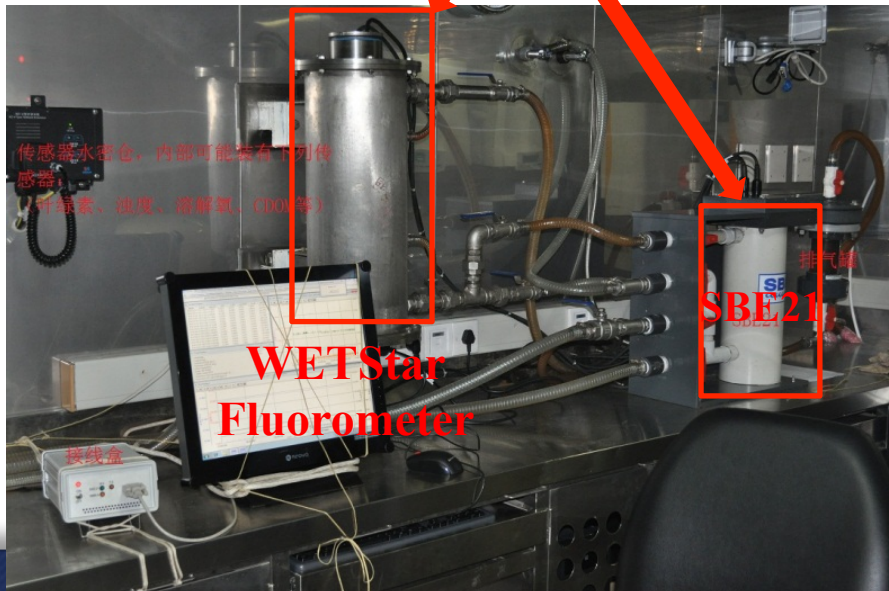
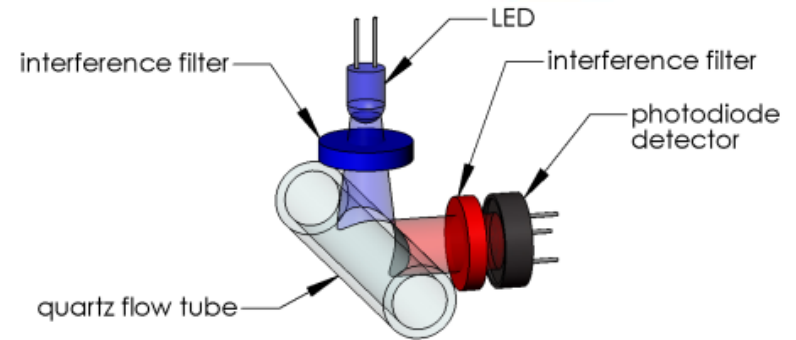
Study area & research method

2. High frequency sampling and data collection system



1. Temperature
2. Salinity
3. Chlorophyll a

Every 30 seconds



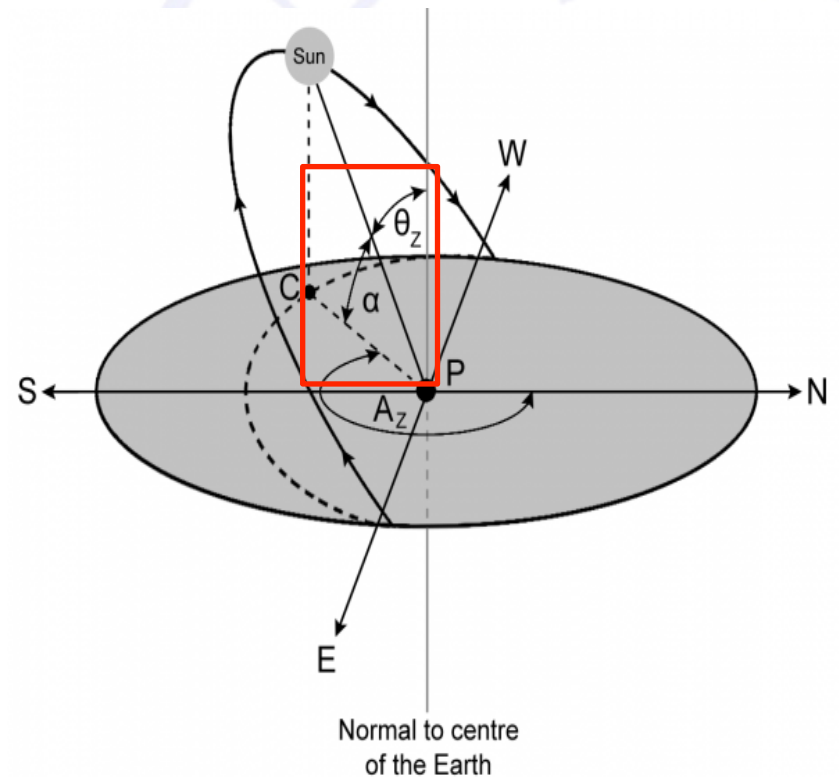
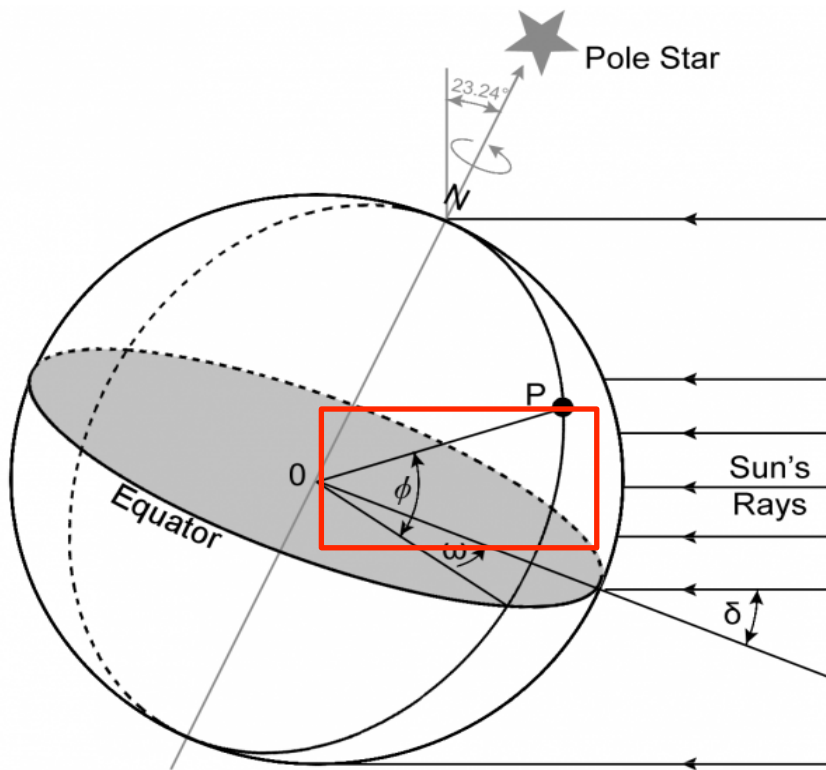
$$\text{CHL}(\mu\text{g/L}) = \text{Scale Factor} \times (\text{Output} - \text{Clean Water Offset})$$

Clean Water Offset (CWO)	0.059 V
Scale Factor (SF)	4.6 $\mu\text{g/L/V}$

Study area & research method

3. Solar elevation angle calculation method

The midday solar altitude was used to determine the solar radiation level.



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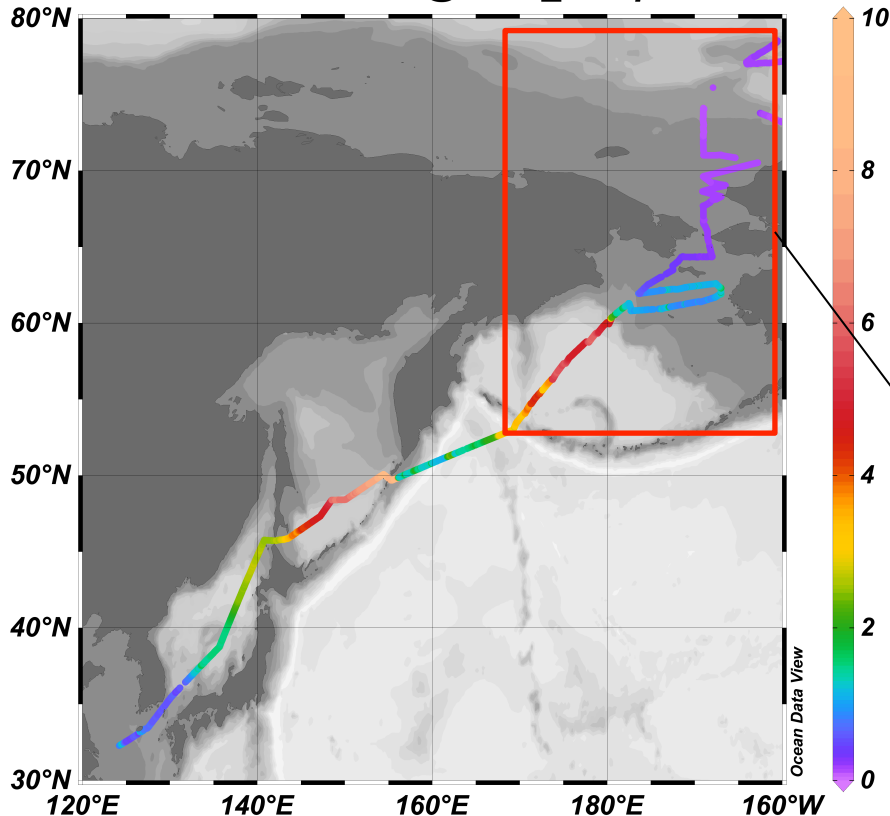
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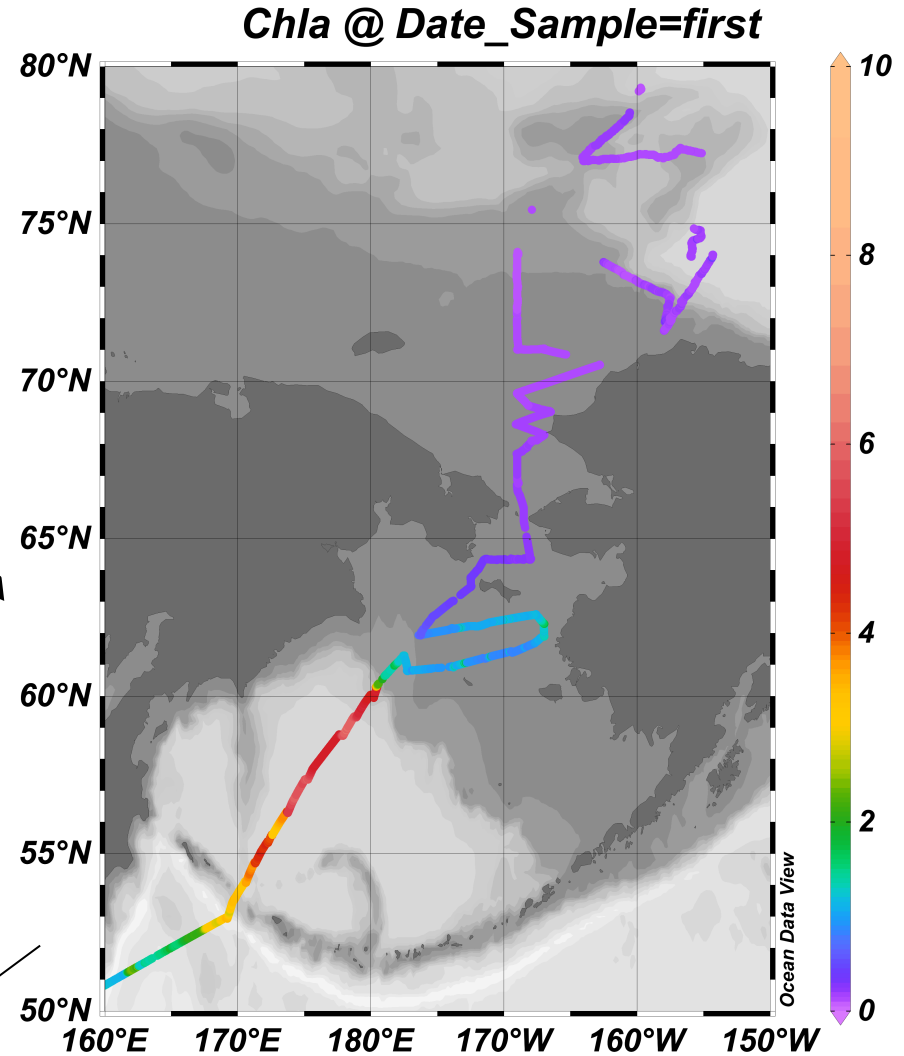


Spatial distribution of Chlorophyll

1. Spatial distribution of Chla

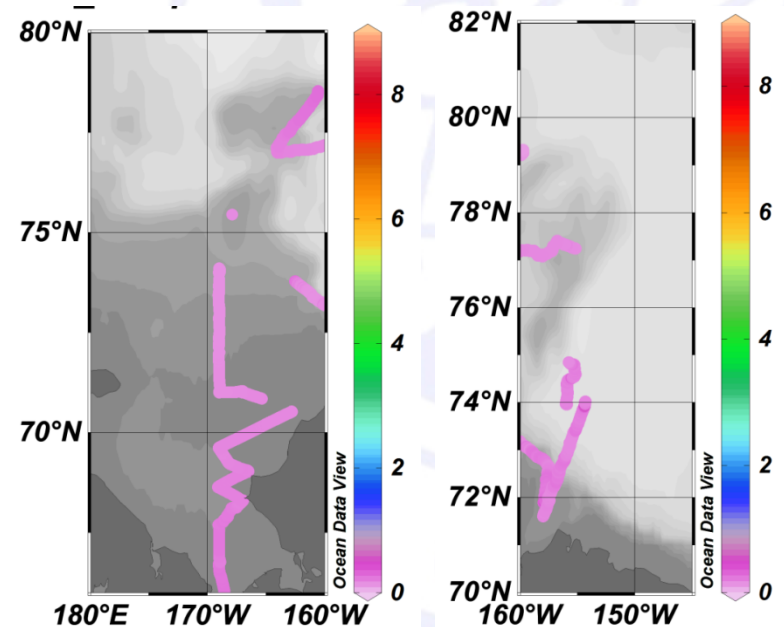
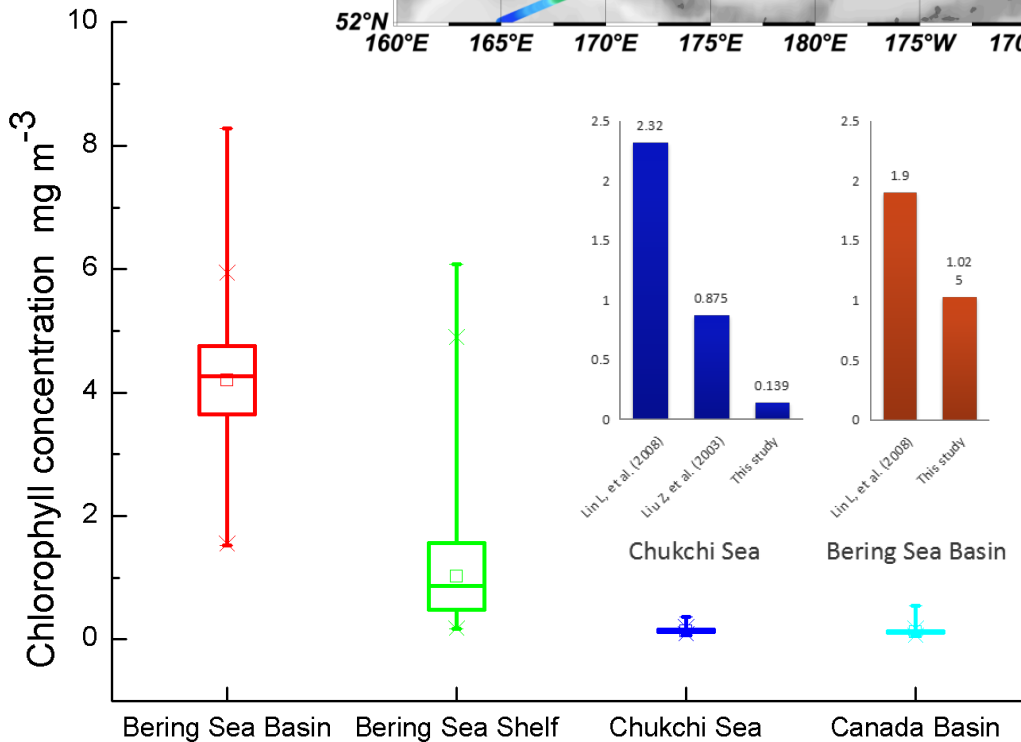
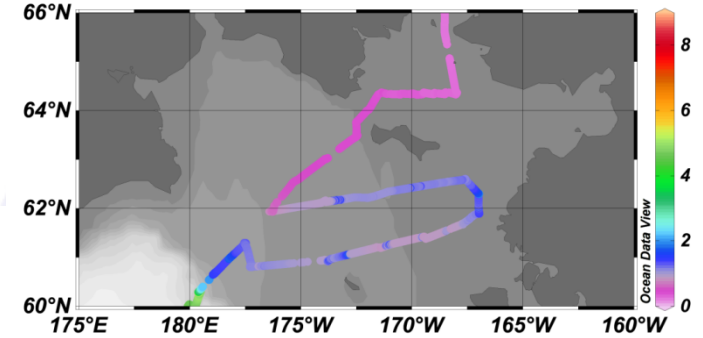
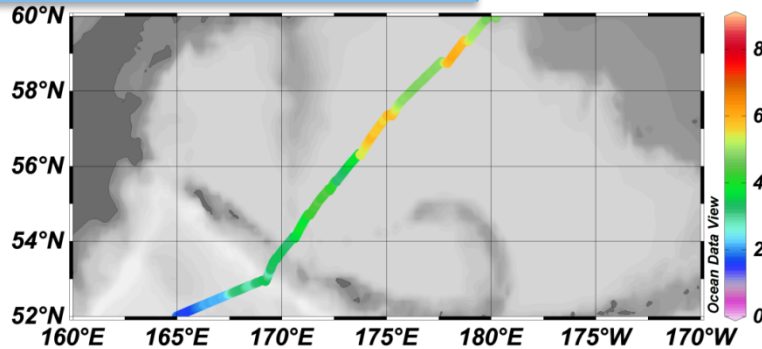


Average Value: 1.166 mg m^{-3} ;
Variation Range: $0.06 \sim 8.283 \text{ mg m}^{-3}$



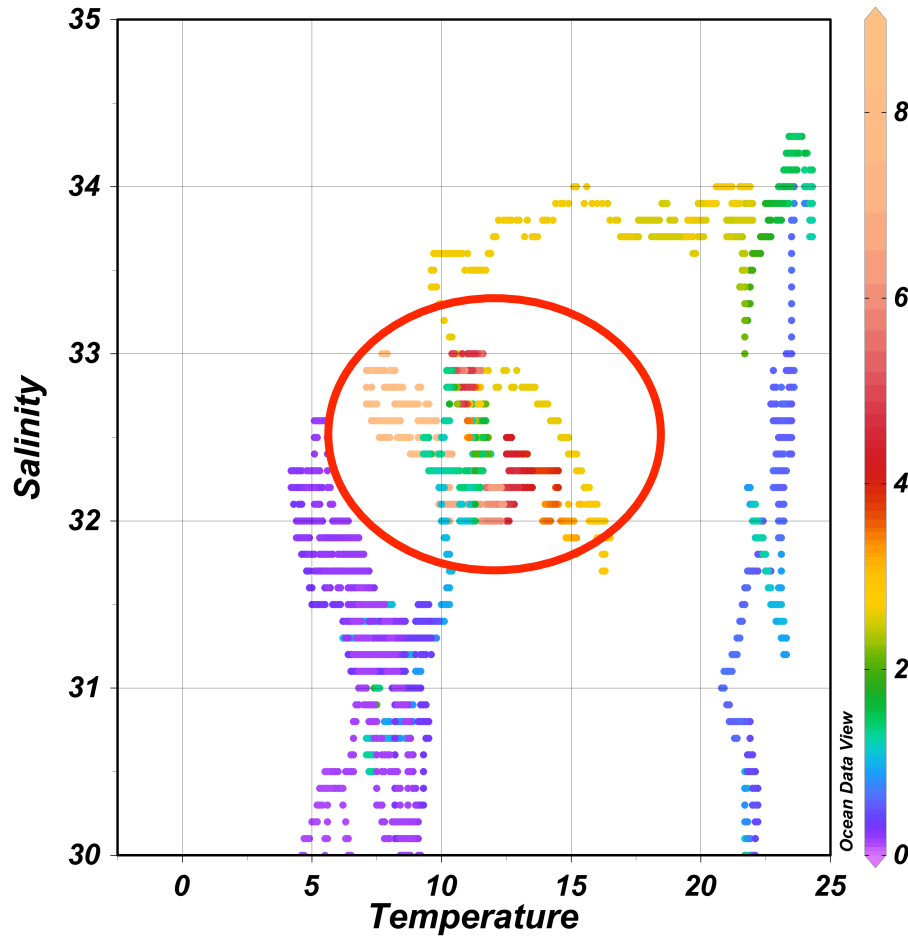
Spatial distribution of Chlorophyll

1. Spatial distribution of Chla

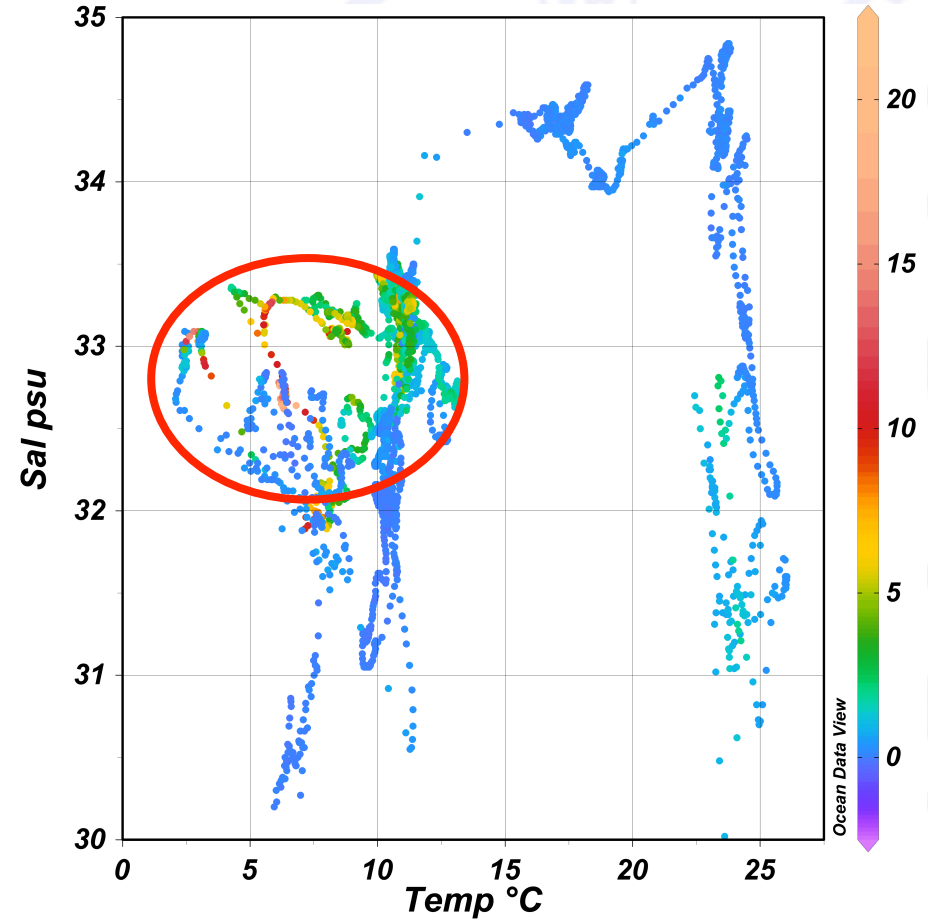


Spatial distribution of Chlorophyll

2. 2014 VS 2016 summer



6th Arctic Expedition of China (07.11~08.26, 2014)



7th Arctic Expedition of China (July 12-26, 2016)

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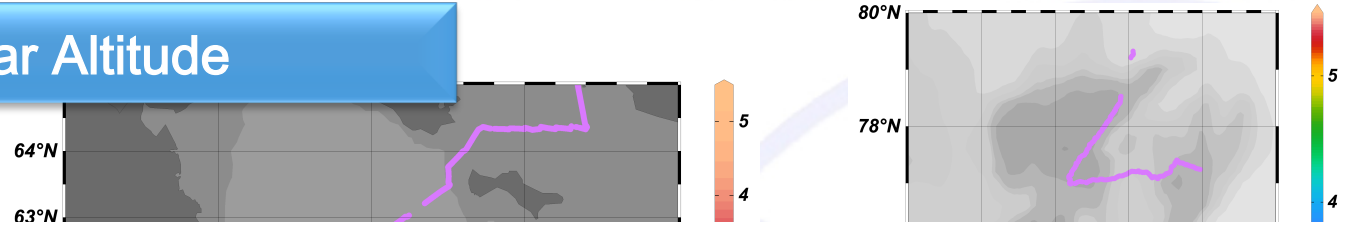
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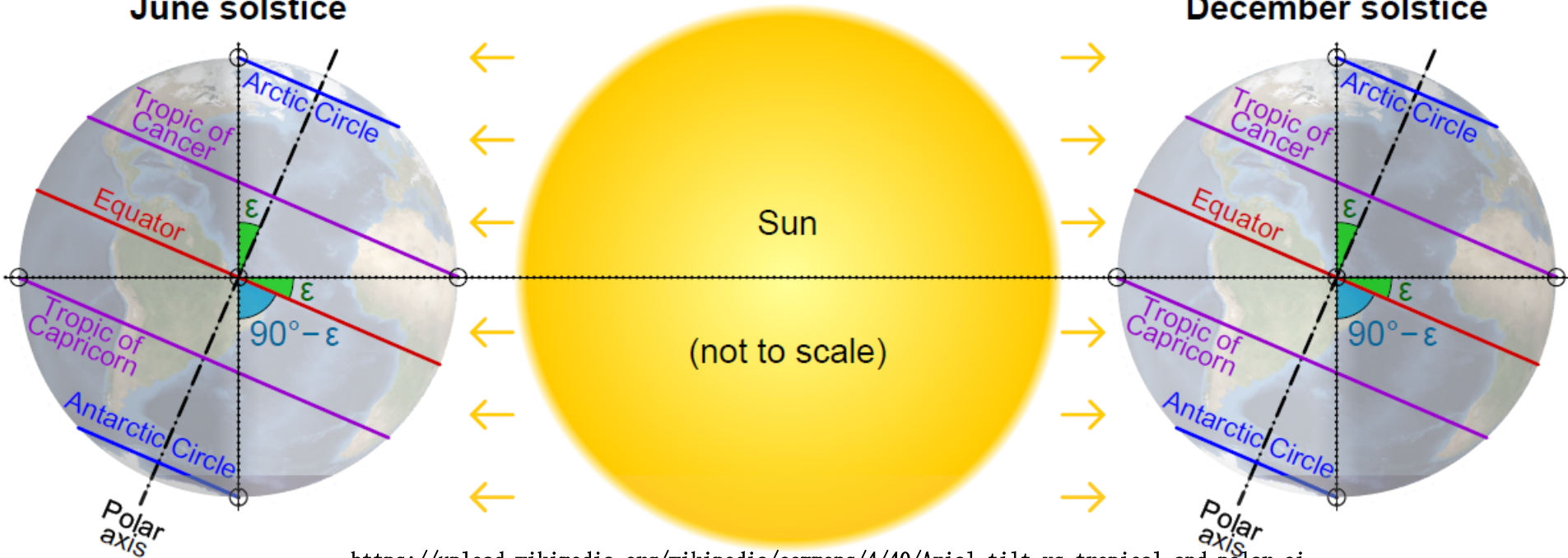
Impact factors analysis & discussion

1. Latitude and Solar Altitude

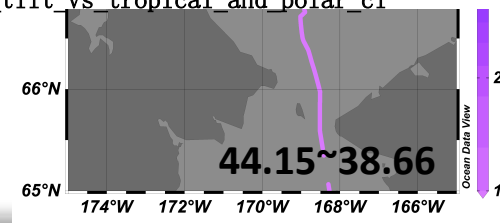
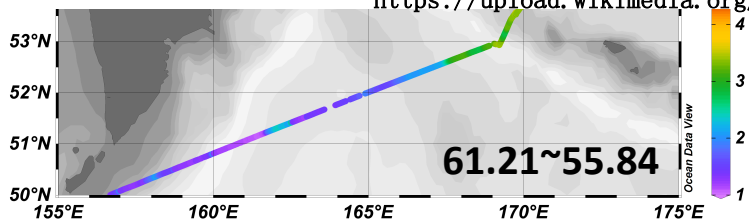


June solstice

December solstice

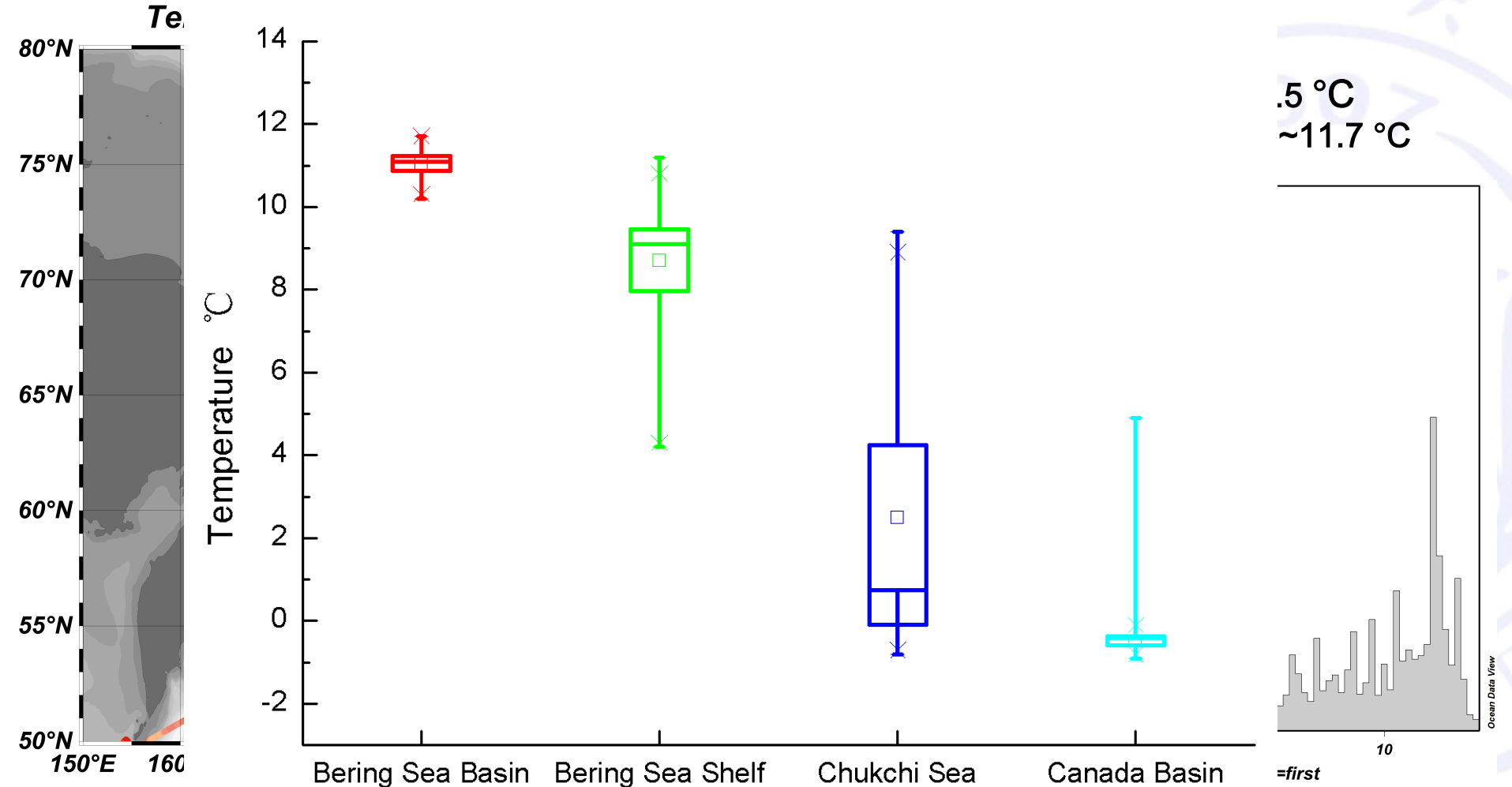


https://upload.wikimedia.org/wikipedia/commons/4/40/Axial_tilt_vs_tropical_and_polar_circles.svg 1/



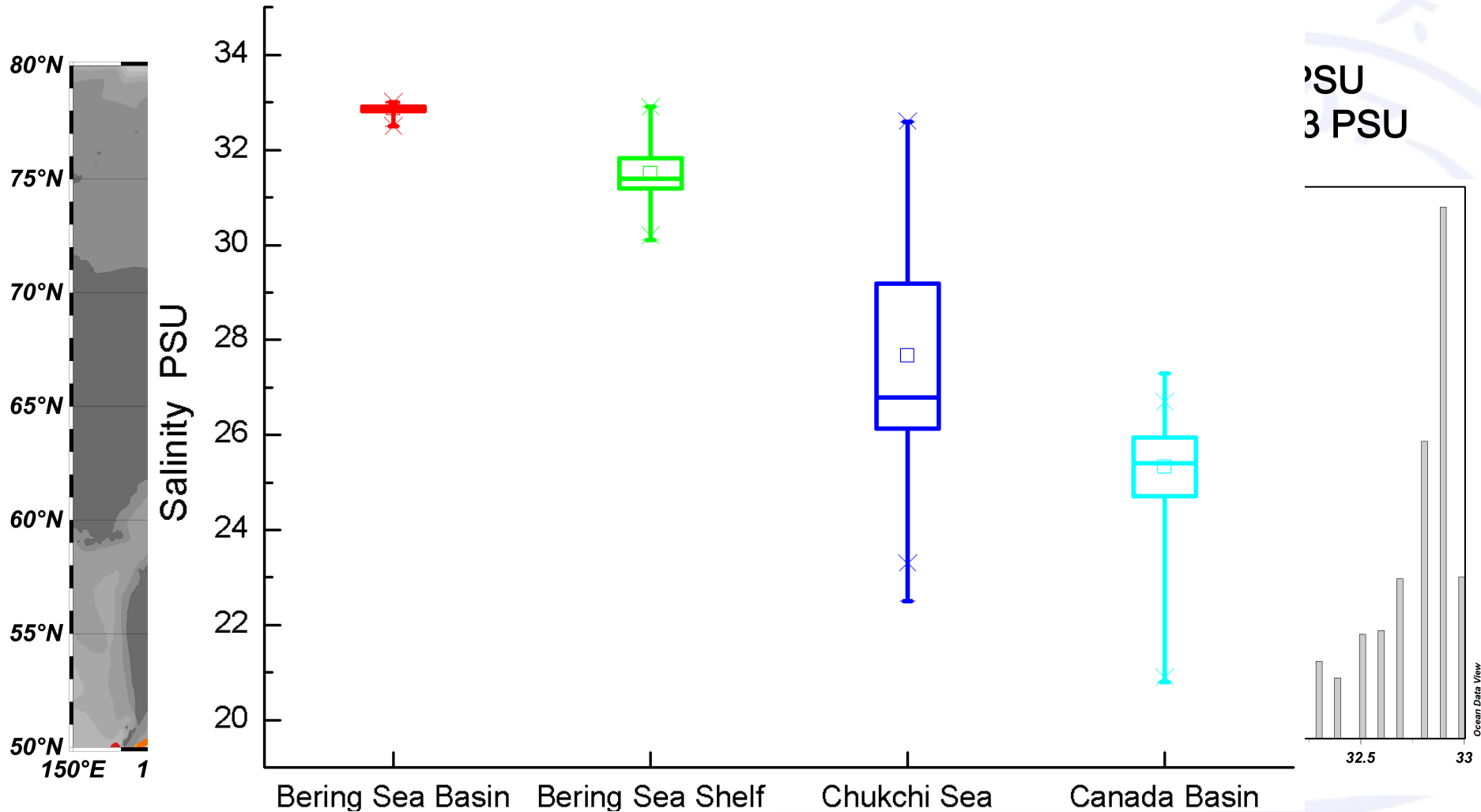
Impact factors analysis & discussion

2. Sea Surface Temperature



Impact factors analysis & discussion

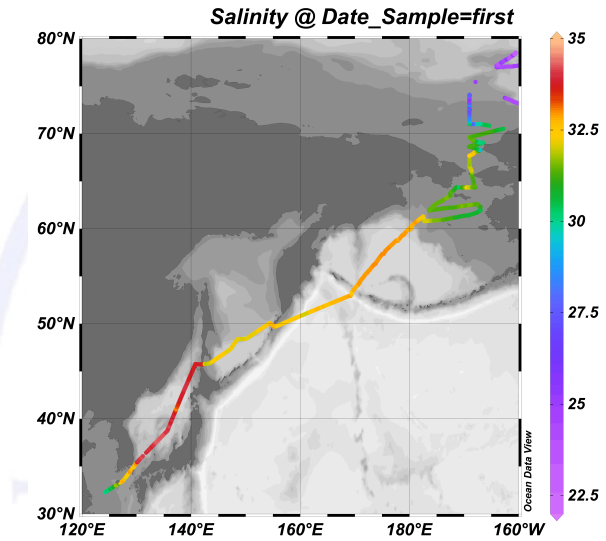
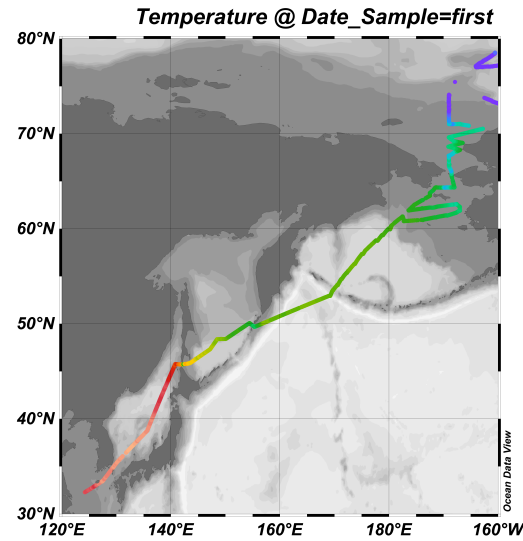
3. Sea Surface Salinity



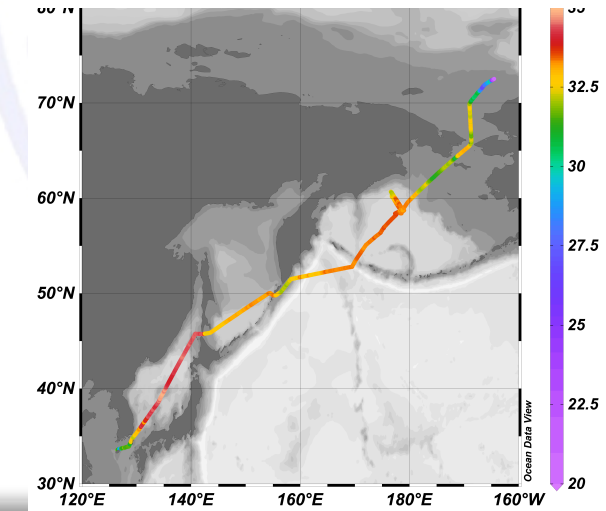
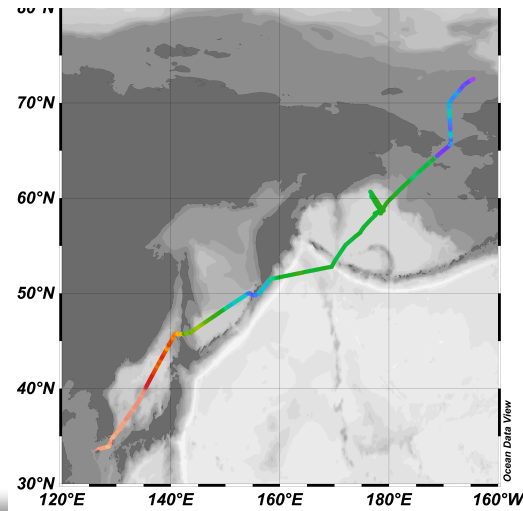
Impact factors analysis & discussion

4. Sea Surface Temperature and Salinity 2014 VS 2016 summer

6th Arctic Expedition of China
(07.11~08.26, 2014)



7th Arctic Expedition of China
(07.12-26,2016)

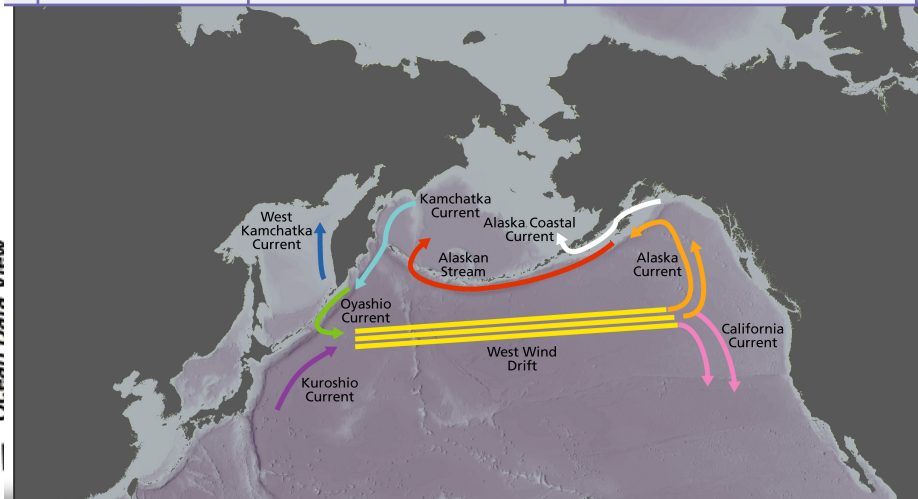
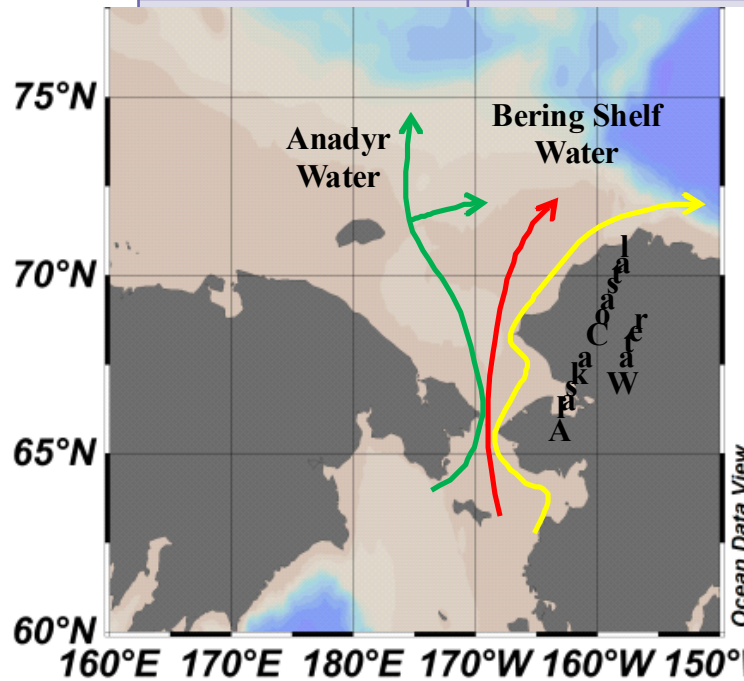


Impact factors analysis & discussion

5. Correlation Analysis of impact factors

**significant on 0.1level (two tail)

Chlorophyll <i>a</i>	Temperature	Salinity	Solar Altitude	
1	0.061**	0.306**	-0.119**	Chlorophyll <i>a</i>
	1	0.417**	0.476**	Temperature
		1	0.436**	Salinity
			1	Solar Altitude



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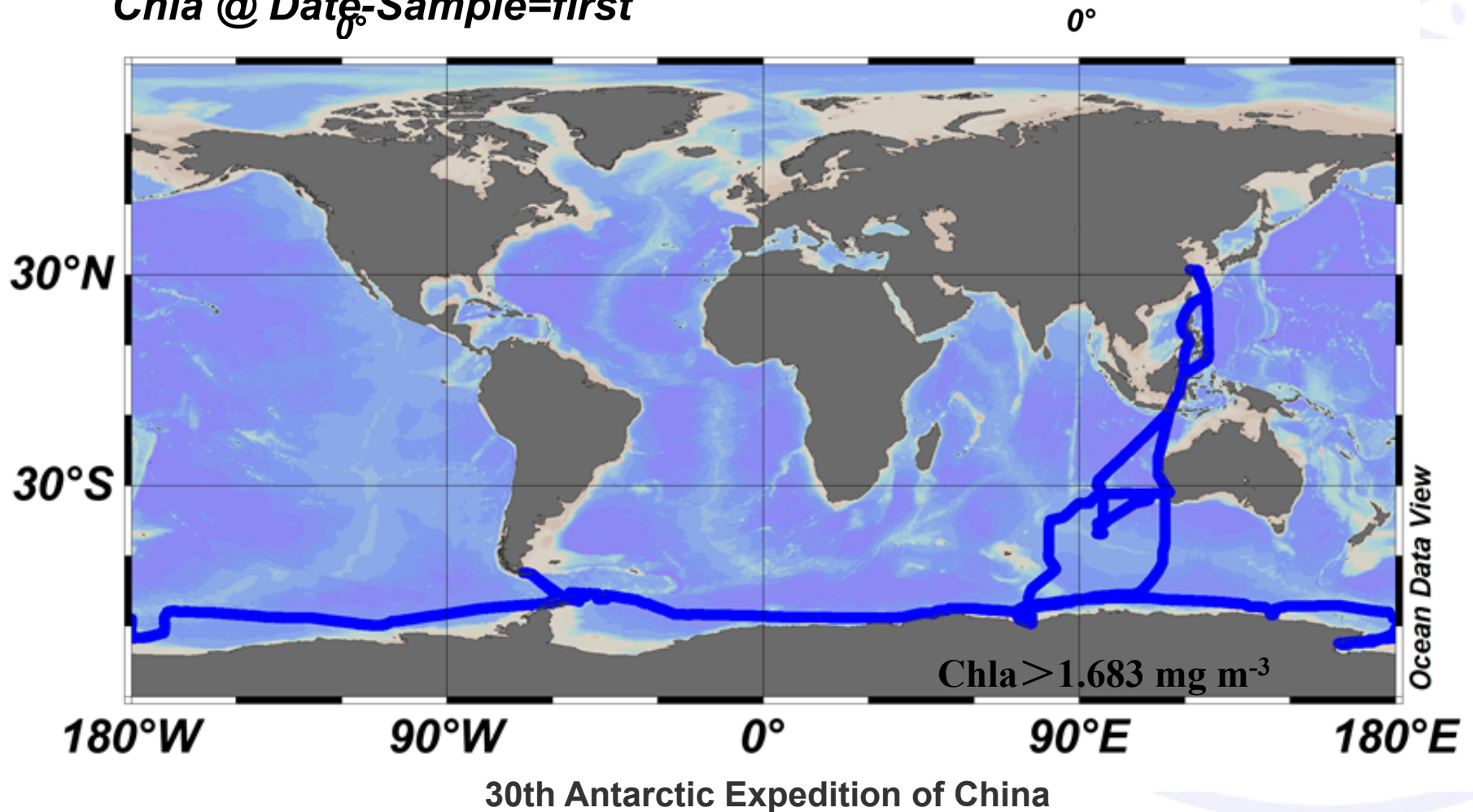
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Further research field & cooperation

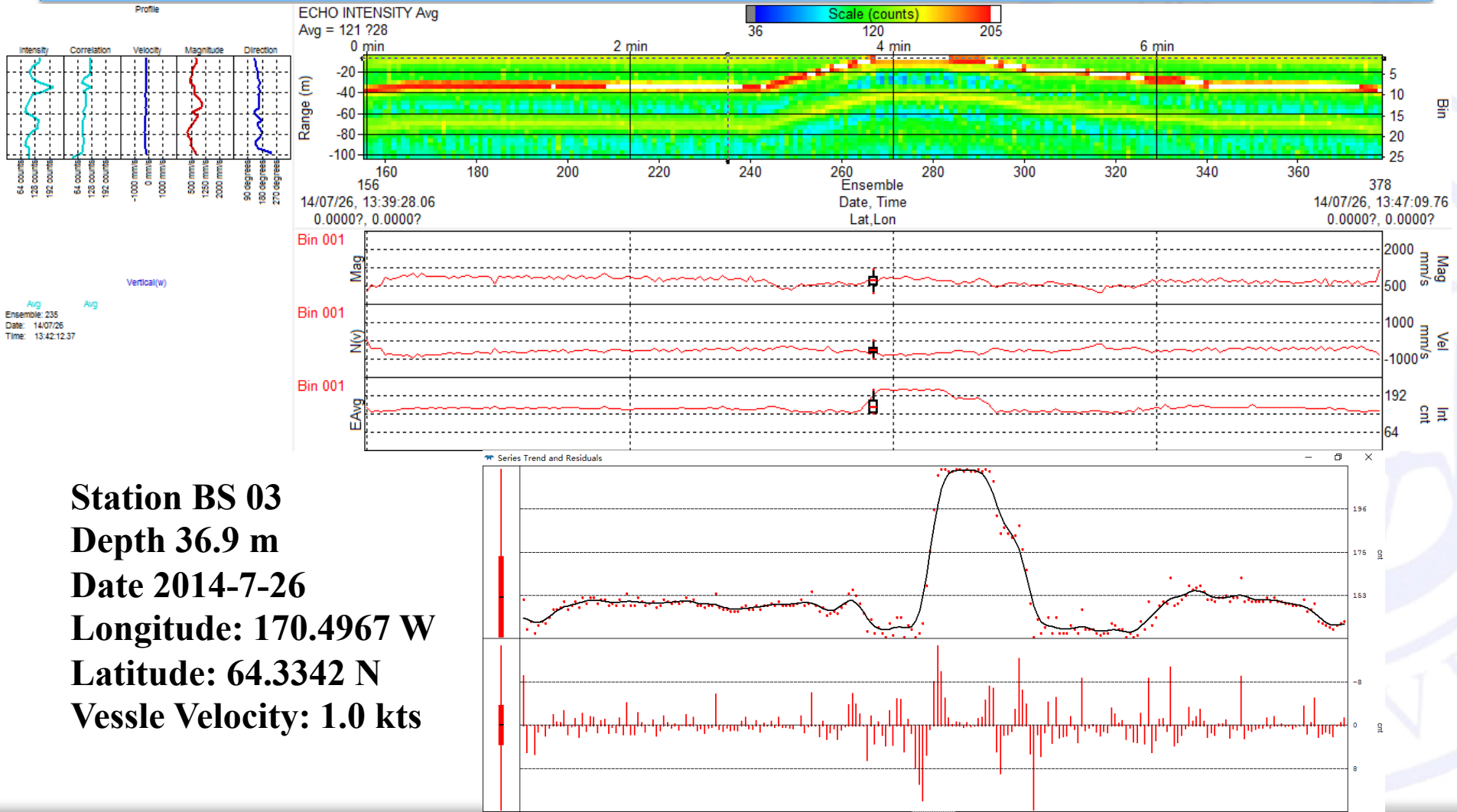
1. Similar Research in Antarctica Southern Ocean

Chla @ Date-Sample=first



Further research field & cooperation

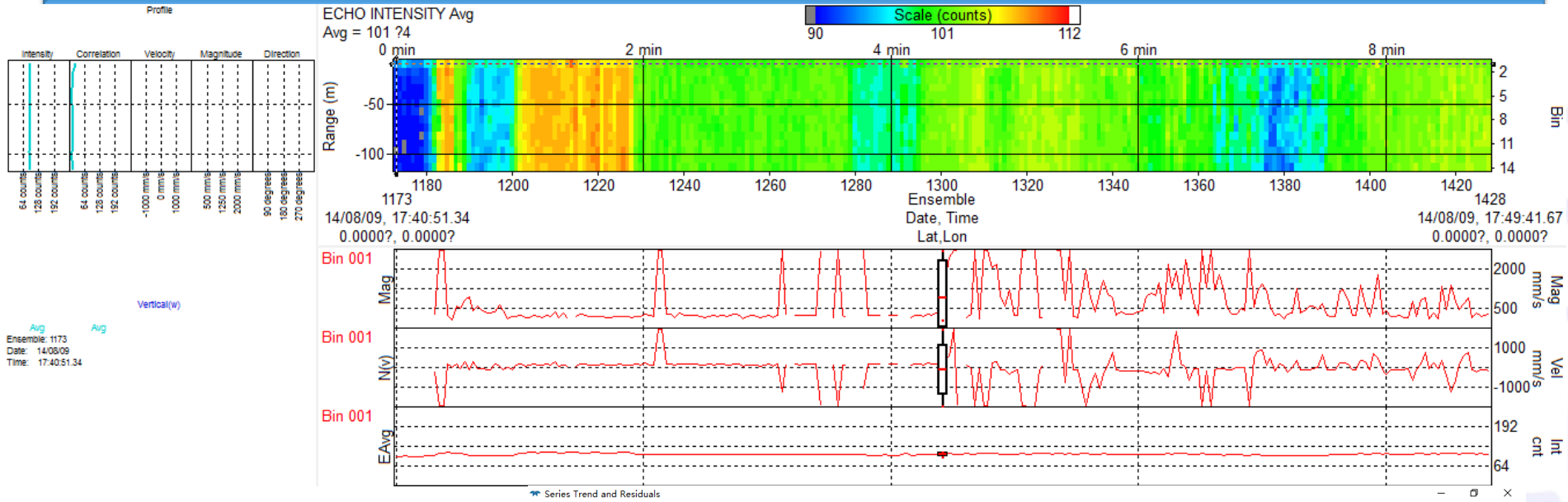
2. Biomass estimation with echo intensity data from ADCP



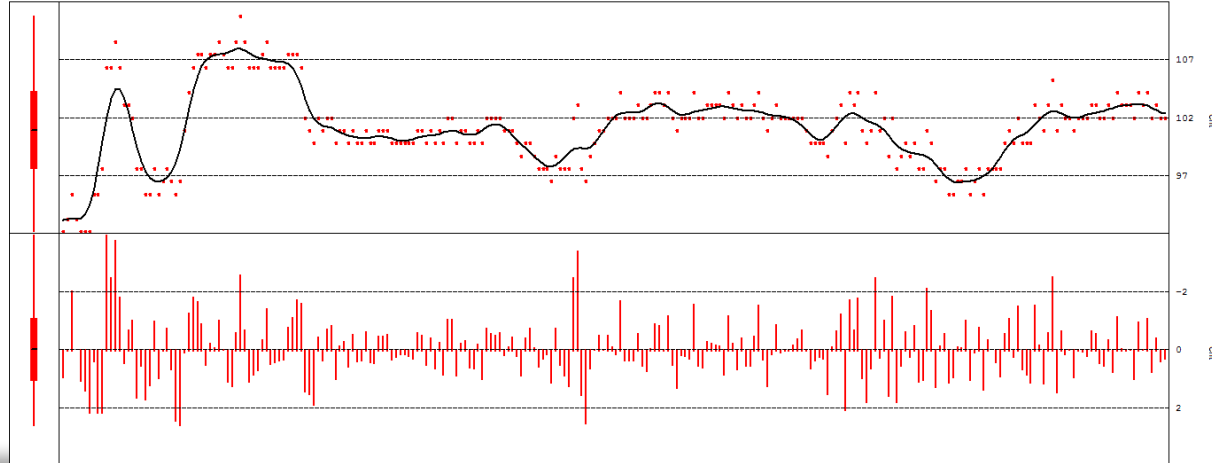
Station BS 03
Depth 36.9 m
Date 2014-7-26
Longitude: 170.4967 W
Latitude: 64.3342 N
Vessel Velocity: 1.0 kts

Further research field & cooperation

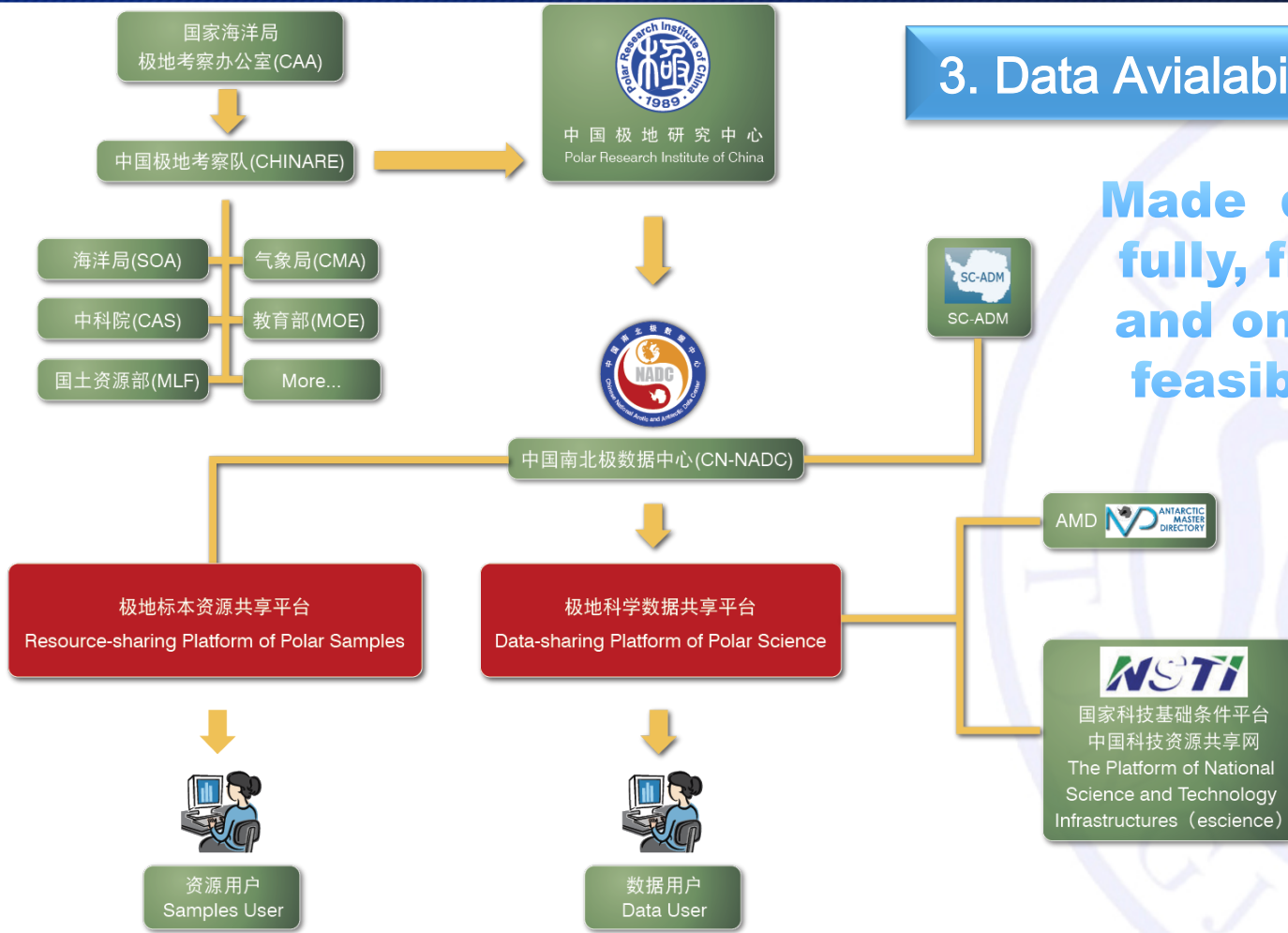
2. Biomass estimation with echo intensity data from ADCP



Station C25
Depth 3767.6 m
Date 2014-8-9
Longitude: 149.0312 W
Latitude: 76.4010 N
Vessel Velocity: 0.5 kts

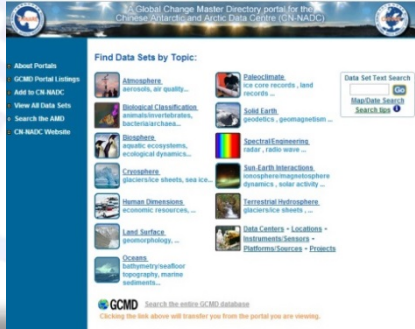
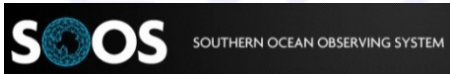


Further research field & cooperation



3. Data Availability and cooperation

Made data available fully, freely, openly, and on the shortest feasible timescale



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CONCLUSION

- (1) In Bering Sea to Chukchi Sea, **chlorophyll a** concentration presents obvious **decreasing trend from south to north**; as for thermohaline structure, due to the influence of Bering Sea water which with higher temperature and salinity flow into Chukchi Sea through Bering Strait, **temperature and salinity** also present **obvious decreasing trend from south to north**.
- (2) Through correlation analysis among chlorophyll a concentration, temperature, salinity and solar altitude we found that, in Bering Sea to Chukchi Sea, for **phytoplankton growth**, temperature and solar radiation level have little impact, however, the **lower salinity level in this sea area is unfavorable factor**.
- (3) Another **important impact factor** for phytoplankton growth is **nutrient distribution**, which is inseparable **with ocean currents** distribution in study area. In Bering Sea to Chukchi Sea, **nutrient level** is mainly determined by **Anadyr water and Bering shelf water** with **high nutrient flow** from south to north, which corresponded with the trend that **chlorophyll a concentration** decreasing **from south to north**.

Thanks your attention



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