Development and Application of Marine Ecological and Environmental Monitoring System in the Yellow Sea and Polar Region

National Ocean Technology Center of China

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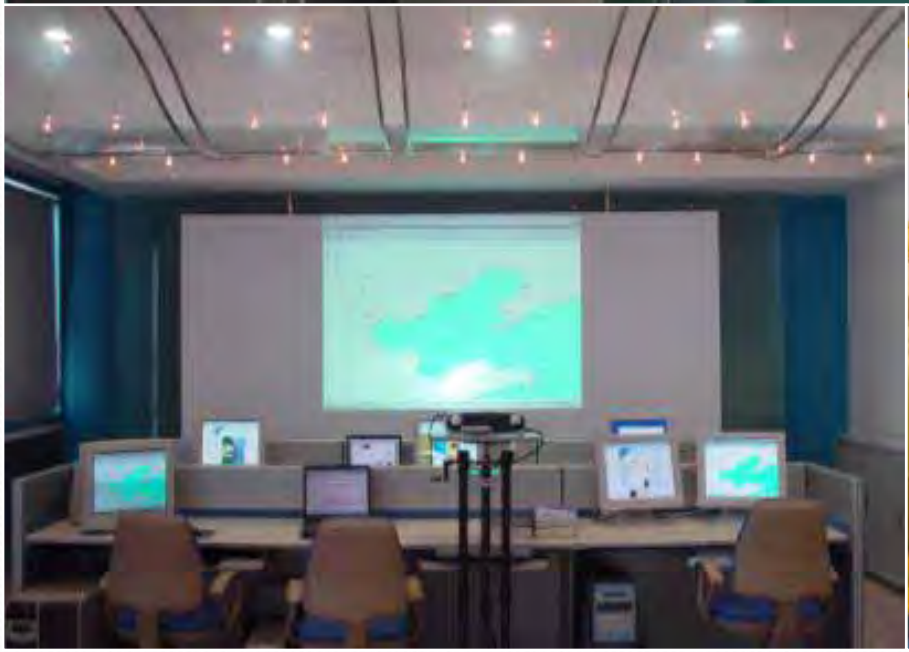
National Ocean Technology Center

National Ocean Technology Center

- Administrated by State Oceanic Administration of China;
- Implement national marine technology operational management;
- provide technical support for national marine planning;
- take on marine high technology development;

National Ocean Technology Center

- 13 research sectors, including marine environmental monitoring, marine ecological monitoring, marine remote sensing, buoy engineering, marine renewable energy utilization and so on.

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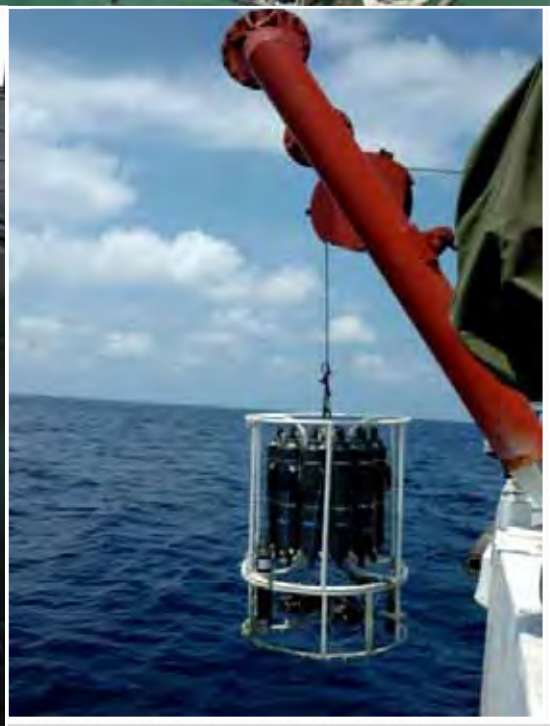


Outline

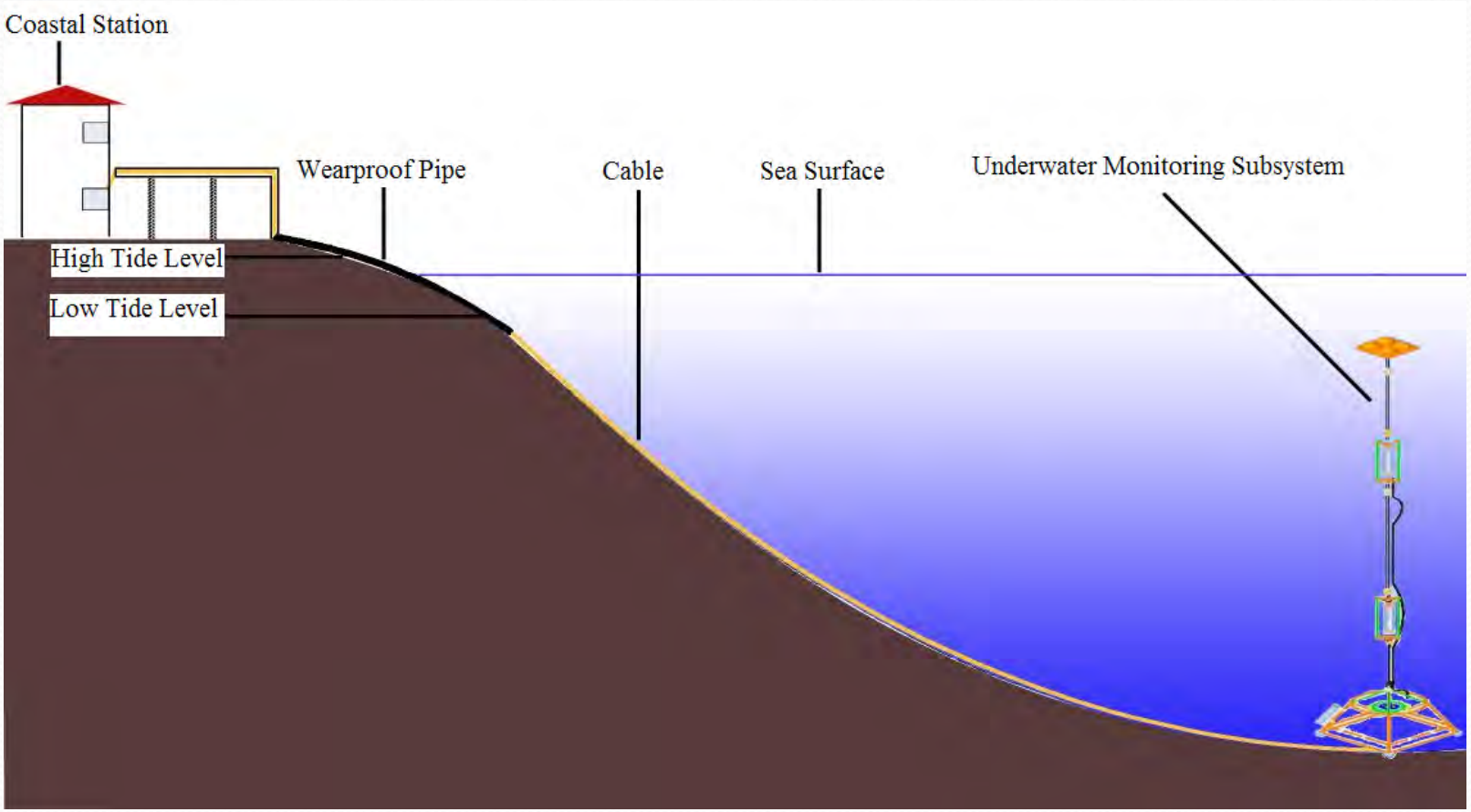
- **Introduction of Marine Ecological and Environmental Monitoring System (MEEMS)**
- **Development of MEEMS**
- **MEEMS Deployment in the Yellow Sea of China**
- **MEEMS Deployment in Polar Region**
- **Conclusion**

Introduction of MEEMS

- Funded by Chinese High-Tech Research and Development Program;
- 2007.12-2010.12;
- 5 million Yuan RMB.

Introduction of MEEMS

- continuously measure the coastal marine ecological and environmental parameters for a long time .
- monitoring parameters include chlorophyll, pH, PAR, ORP, C, T, D and currents.



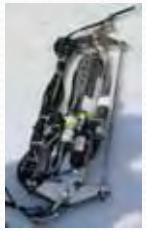
sketch map of MEEMS

Development of MEEMS

- underwater monitoring subsystem;
- data transmission and power subsystem;
- data processing subsystem.

Underwater Monitoring Subsystem

- two sets of SBE16 Plus V2 CTD attached to the Kevlar umbilical;
- a set of SBE 37-SIP CTD;
- a set of WHM-600 ADCP mounted on the bottom framework.



surface

seawater

seafloor

Instrumentation

- ADCP

- CTD

- pH Sensor
- ORP Sensor

- Fluorometer

- PAR Sensor

- ORE release

Data Transmission and Power Subsystem

- contains mainly a 1km cable, with two signal lines and two power lines;
- serial RS485 communication for data transmission;
- power supply is provided in the coastal station.

Data Processing Subsystem

- The data processing subsystem uses a designated computer located in the shore-based field station to receive the data every 10 to 30 minutes (specified by user). The data is preprocessed and then be transmitted to users through emails.

Deployment in the Yellow Sea

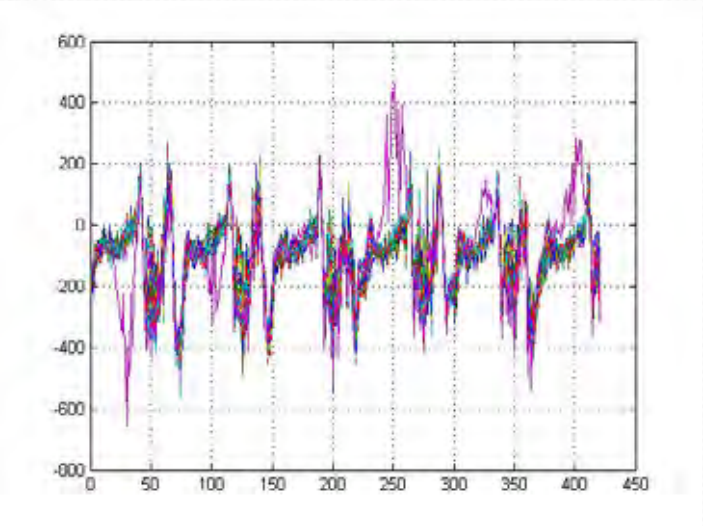
- MEEMS was firstly deployed in the Yellow Sea of China in September 2009.
- The purpose of the trial is to verify the reliability and applicability of the system.
- The deployment site is about 800 meters away from the coastline and the depth is about 25m.

Deployment Site

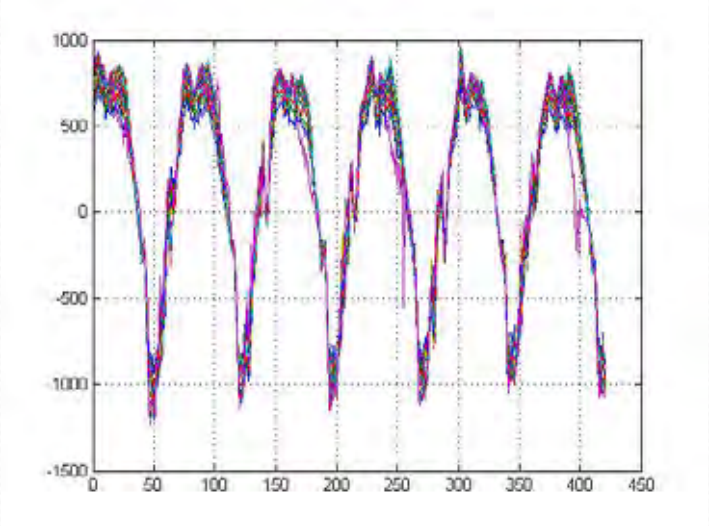
deployment preparation

Data Acquired

- More than 2100 groups of data were acquired during the test.



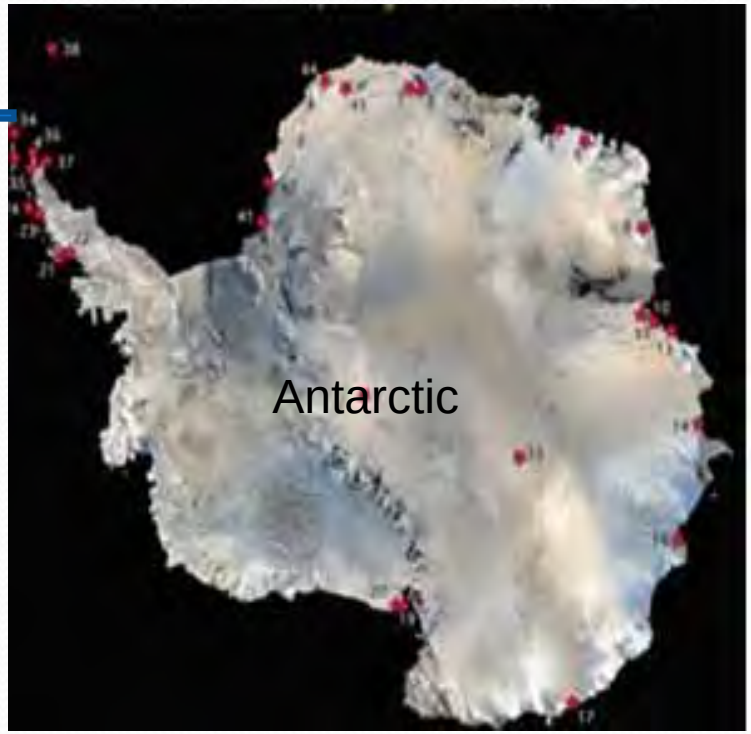
ADCP U velocity



ADCP V velocity

Deployment in Polar Region

- The deployment site is in the Great Wall Bay, west of King George Island.



Deployment in Polar Region

- depth near the shoreline is about 30m;
- current speed is less than 3 knots;
- it's close to the shore-based field station to lay a power cable.

Deployment 2009/2010

- MEEMS was firstly deployed in December 2009.
- to verify the reliability of the system and its applicability in the Antarctic Ocean.

Deployment 2009/2010

- Firstly, a channel was cut to lay the cable;
- Secondly, the cable was carried on board and spread out during the sail of the vessel;
- Finally, while arriving at the designated site, the underwater monitoring platform was deployed.

Deployment 2009/2010

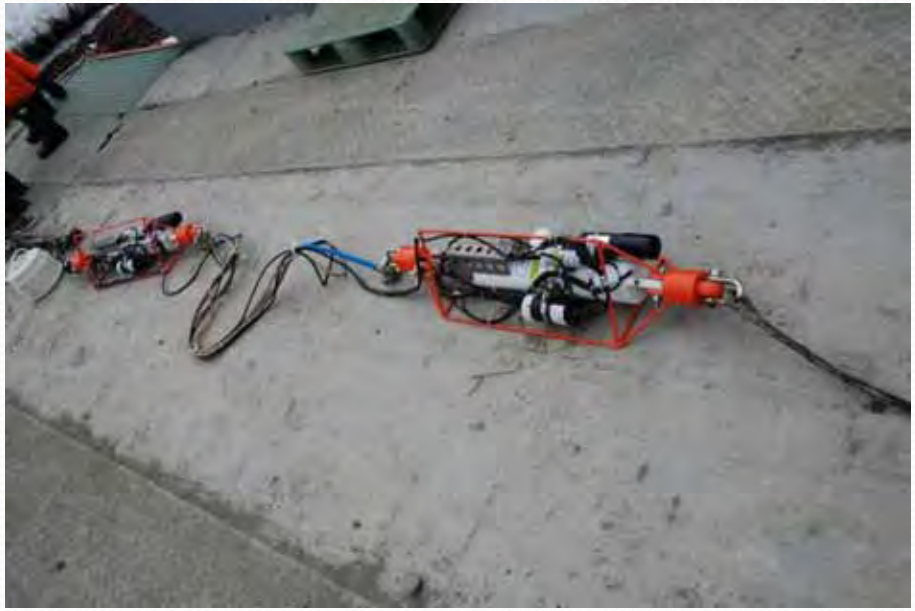
- 4 months of test;
- more than 17 thousands groups of data.

Retrieval

Deployment 2010/2011

- In December 2010, the system was deployed again.
- The purpose is to acquire more continuous monitoring data, accumulating experience and fundamental data for the future monitoring.

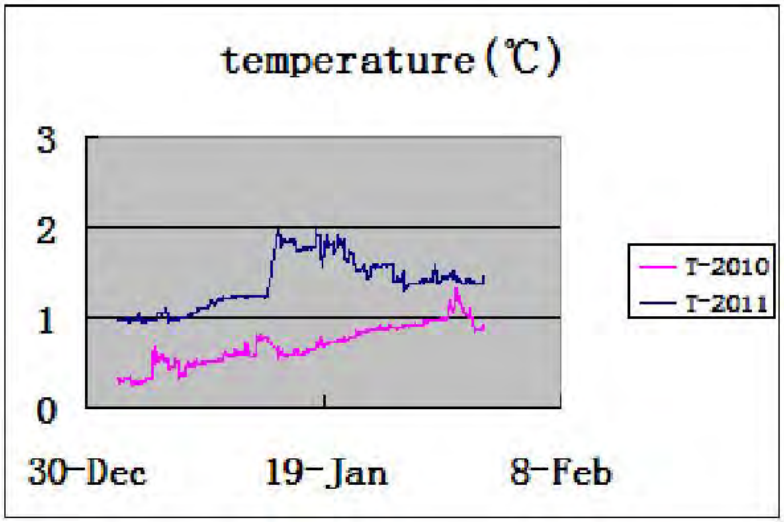
Deployment 2010/2011

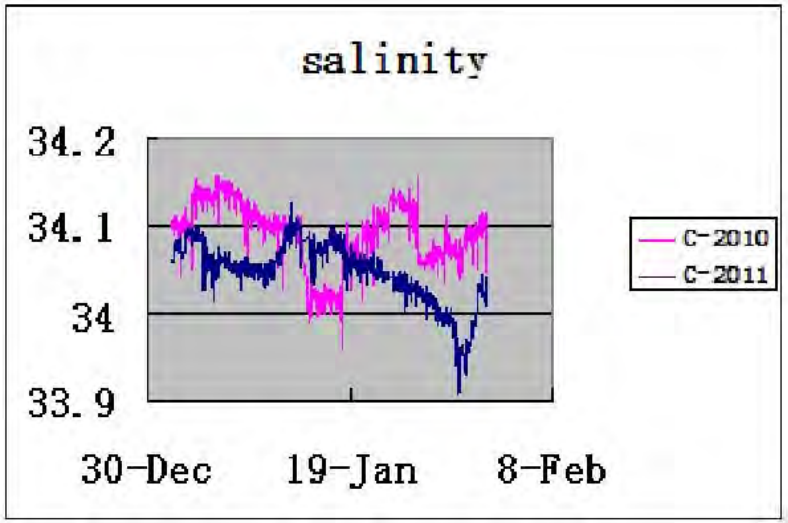


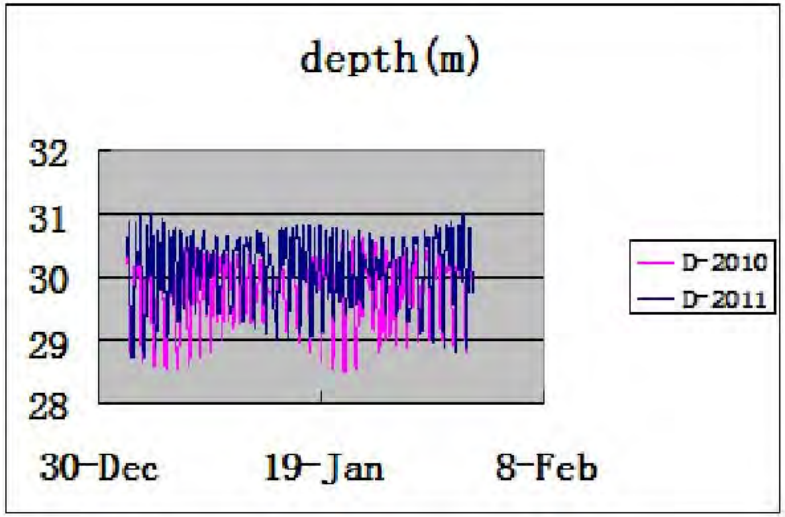
Data Analysis 2010/2011

- 5 months of test;
- more than 20 thousands groups of data .

CTD Comparison between 2009/2010 and 2010/2011

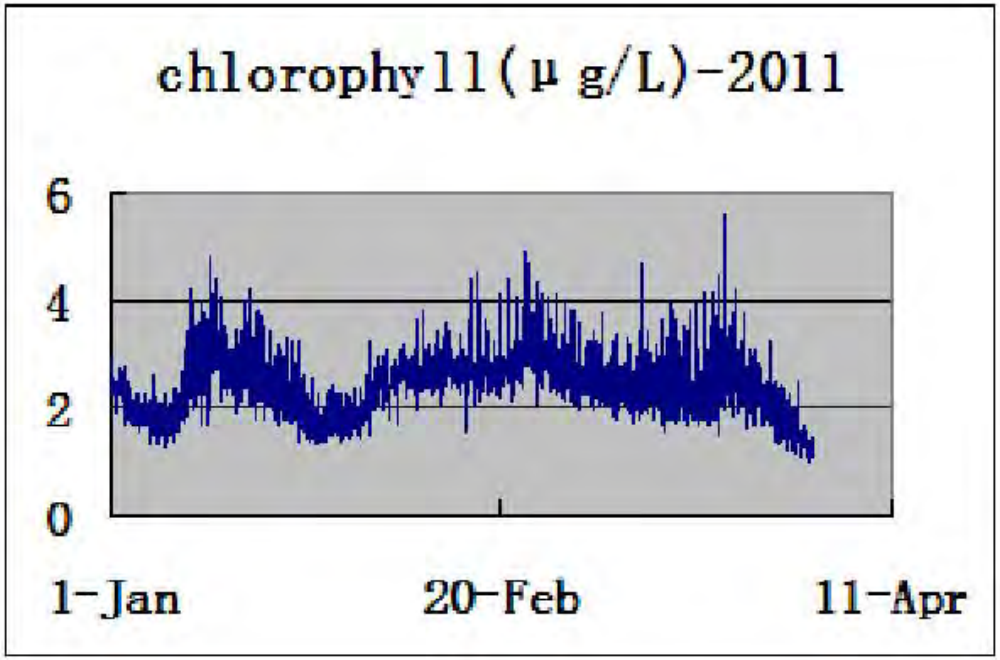






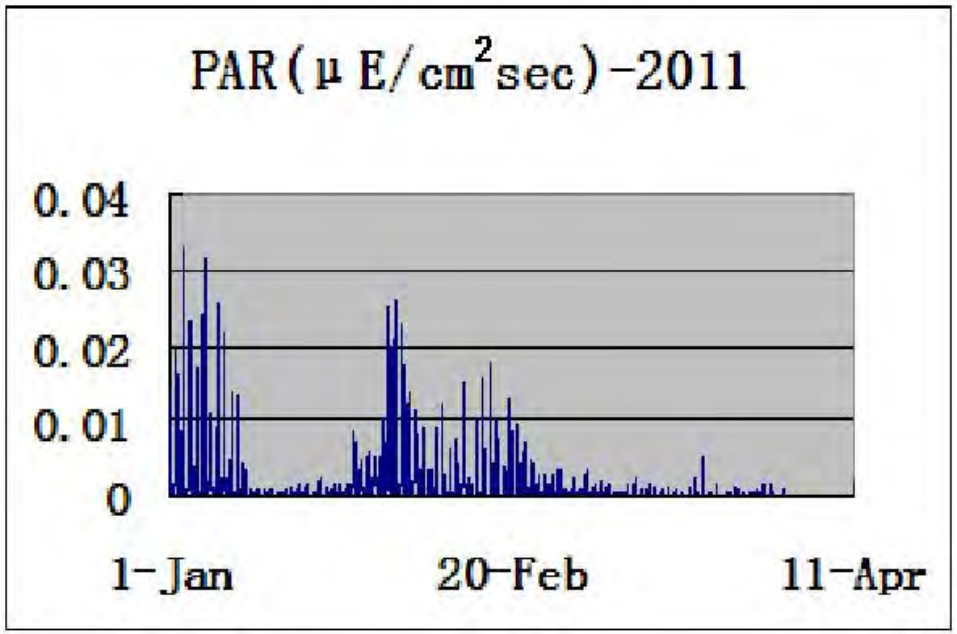
Data Analysis 2010/2011

- chlorophyll in the upper level (12m, as shown below) is about 2.5 times than that of the lower level (18m);



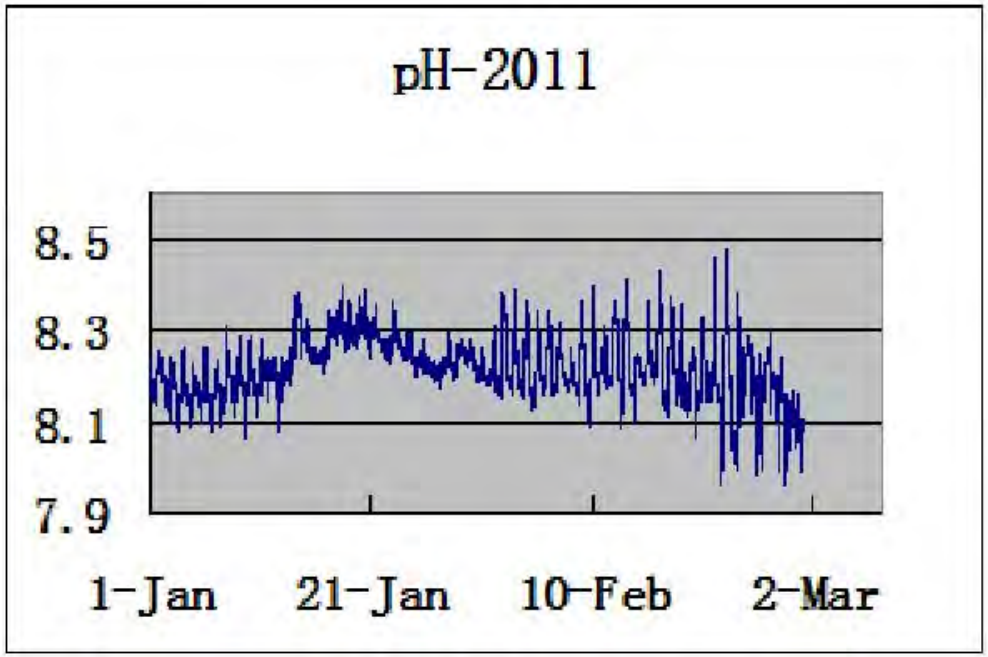
Data Analysis 2010/2011

- measurement of PAR in the upper level (as shown below) is about 3 times than that of the lower level;



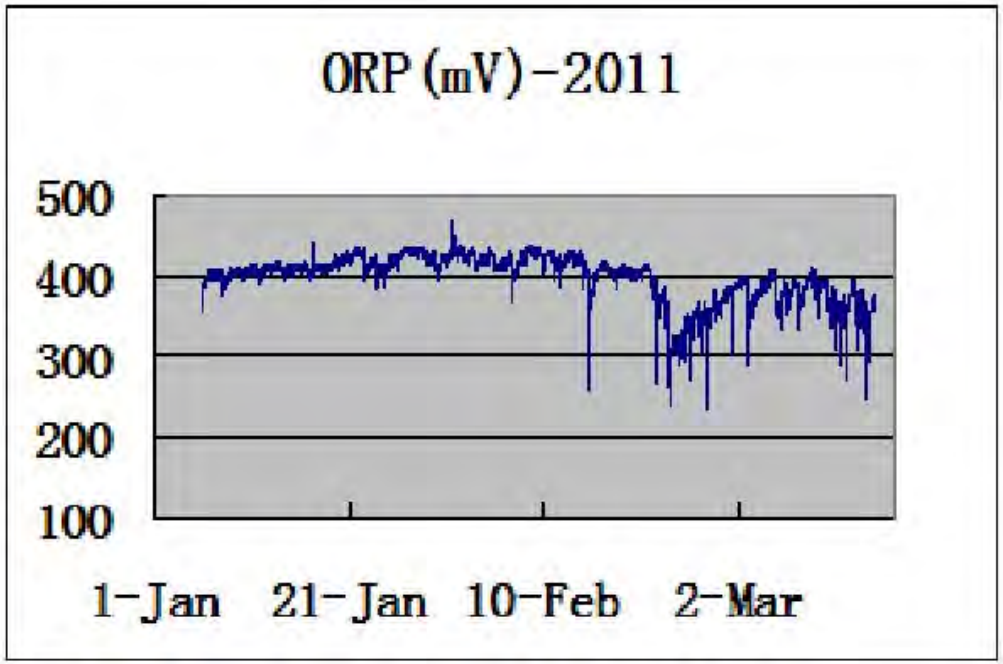
Data Analysis 2010/2011

- The upper level pH 7.8-8.4 (as shown below) is higher than the low level pH with 7.6-8.2;



Data Analysis 2010/2011

- The difference between the two levels of ORPs is not obvious (the upper level as shown below).



Conclusions

- MEEMS has acquired more than 40 thousands groups of data, which is typical of the status of the Great Wall Bay and could be used in marine ecological and environmental modeling of Antarctic Ocean;
- We plan to deploy MEEMS again in December 2011;
- MEEMS is an early but beneficial trial system for marine ecological and environmental monitoring in the Antarctic Ocean.
- MEEMS provide an effective tool for long-term and continuous monitoring of marine ecology and environment.