NEAR–GOOS Climate Monitoring Section

A pilot project of JMA and POI, 2011-2015

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Global warming may slow down deep–ocean water production & circulations that are driven by sea surface cooling. This may affect climate pattern.

Changes in deep–sea water & circulations are expected to appear earlier in isolated seas.

WG–I Report of IPCC’s 4th Assessment Report:
- “Because of this sea’s limited size, it responds quickly through its entire depth to surface forcing changes.”
- “The warming … is clearly apparent in this isolated basin, which warmed by 0.1 °C at 1,000m and 0.05 °C below 2,500m since 1960s.”
- “Deep water production in the Japan Sea slowed for many decades, with a marked decrease in dissolved oxygen from the 1930s to 2000 at a rate of about 0.8µmol/kg/yr.”
Increasing of deep water temperature and decreasing of dissolved oxygen in the eastern part of the sea.
Trends of bottom water T and DO (1950–2011)

Тенденция роста температуры воды и понижения содержания растворенного кислорода донных вод, отражающая глобальное потепление климата, была прервана аномально холодной зимой 2001 гг, однако в дальнейшем режим ослабления вентиляции был восстановлен.
1. Complete cross-basin sections were hardly carried out, partly due to national EEZ borders.
2. Thus JMA & POI suggested to make observations along a line connecting Japan & Russia in a synchronized manner.
3. Observation data will be exchanged between JMA & POI. Results will be available through Regional Data Bases for all NEAR–GOOS participants.
4. Observations along the same line will be continued in the following years, producing long-term dataset.
5. The project was approved by NEAR–GOOS CC meeting in 2011 and started the same year.
Observation Details

- Observation period 2011–2015:
  - Late October–early November

- Observed elements:
  - CTD & water sampling down to the bottom
  - Parameters observed:
    - Temperature, Salinity,
    - Oxygen, Nitrate, Nitrite, Silicate, pH
    - Total inorganic carbon, Alkalinity
Climate Monitoring Section Implementation

r/v Akademik M.A. Lavrentyev
Akademik Oparin, Prof. Gagarinskiy

r/v Keifu-maru

Synchronised CTD observations:
2011 Oct–Nov
2012 Oct–Nov
2013 Oct
2014 Oct
2015 Oct
Presentation of Data

http://goos.kishou.go.jp/rrtdb/cross-section/cross-section.html

Both plots and data are available
Cross-section implementation

- **Used equipment:** JMA POI

- Temperature CTD: SBE3plus SBE3plus
  - Reference: SBE35 SBE35

- Salinity/Conductivity CTD SBE 4C SBE4C
  - Reference: Autosal Portosal

- Dissolved Oxygen CTD: Rinko III Rinko III
  - Reference: DOT-01X Dosimate

- Because of different accuracy of instruments an intercalibration is important issue!
JMA-POI Joint Workshops

6-7 Dec, 2012 Tokyo, Japan
7 Dec, 2015, Tokyo, Japan
JMA-POI Data Intercomparison

Japan Basin (2012)

Potential Temperature (°C)

Dissolved Oxygen (µmol/kg)

2012

Cross-Basin obs. in Japan Sea (2014)

Pressure (dbar)

Salinity

2014
Results of CTDO data correction by JMA

Target of JMA uncertainty:

- Temperature (SBE3plus and SBE35): ±0.001
- Salinity (SBE4C and AUTOSAL8400B): <±0.002
- Dissolved oxygen (RINKO and DOT-01X): ±1µmol/kg
Preliminary Results

A tendency of bottom water T increase and DO decrease in relation to global warming.
Presentation of Results

Oral and poster presentations at:
1. WESTPAC Scientific Symposium, 2014
2. PICES-XXIII Annual Meeting, 2014
3. PICES-XXIV Annual Meeting, 2015
Future work on Climate Monitoring

- Continue observations, every year, Sept-Nov period
- Include JMA and POI observations in the east
- Analysis of historical data: $< \pm 0.002$