INTRODUCTION

- Environmental Change in the Arctic Ocean
  - Mean air temperature in recent 5 years warmer than that in 1981-2000
  - Extension of warm Pacific Water to the Arctic Ocean
  - Sea ice extent drastically diminished
  - Increase of annual river discharge to the Arctic Ocean
  - Consequent Arctic sea ice volume diminution but PP increases

- Research Objective
  This study aims to understand water mass distribution and its variability in recent years around the Chukchi Borderland, western Arctic Ocean using ship-based hydrographic data obtained from 2010 to 2016 and yearlong data from several ocean mooring stations.

METHODS & DATA

- Hydrographic Surveys from 2010 to 2016 (Fig.1)
  1) Equipment used on the ice breaker RV ARAON
  - CTD, lowered ADCP, XCTD (Table 1)
  - Bio/Geo/Chemical equipment
  2) Items measured from the Arctic Ocean
  - Temperature, salinity, water velocity, AOOS
  - PAR, transmission, backscatter
  - Atmospheric components, Primary production and new production, Nitrous, POC, DOC, DON, DOP, N2O gas, pCO2, DIC, pH, SS, TA, etc.

- Ocean Mooring Systems
  1) Three mooring systems were recovered from the ice breaker RV ARAON (Figs. 1)
  - CP13, CP14, GAM2 (ADCPs, microCATs, temperature loggers, MMP-type CTD, etc.)
  2) Items measured from the mooring systems
  - Temperature, salinity, water velocity, ice speed, pressure, etc.

- Collection of other datasets
  1) Sea ice data, salinity and ice extent: AMSR2 (http://www.iup.uni-bremen.de/8084/)
  2) SST & sea surface chlorophyll-a: MODIS-Aqua (http://oceandata.sci.gsfc.nasa.gov/)
  3) Atmospheric variables: ECMWF ERA Interim – monthly (http://apps.ecmwf.int/datasets/data/)
  4) Sea ice motion vectors: EORC JAVA (http://www.eorc.jaxa.jp)

RESULTS

- Horizontal distribution of water masses: PSW (BSW,CW) vs. PWW (RW,WW) (Fig. 2)

- Anomaly correlation between variables in August
  - Water: 170W~160W, 74~78N - Atmospheric: 159E~150W, 72~82N - Sea ice: 180~165W, 70~85N

- Nutrient (nitrogen components)
  - Denitrification is carried out by heterotrophic bacteria during which NO2 (or NO3 ) serves as the terminal electron acceptor for organic matter oxidation and the nitrogen oxides are reduced mainly to N2 (Devol, 2008)
  - N2 production = (CNH3)(16PO4/2+9) umol/kg
  - Under a process of denitrification, NO3 is used for organic matter oxidation instead of oxygen, resulting in a decrease in N2 (Nishino et al., 2013)

- Time series of water temperature from ocean mooring systems on the Chukchi Plateau (Fig. 5)
  - CP13: deployed from Aug 2013 to Aug 2015 at northern CP
  - CP14: deployed from Aug 2014 to Aug 2015 at southern CP
  - GAM2: deployed from Oct 2014 to Aug 2015 at the western CP

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4 SUMMARY

- The 7-year hydrographic survey data and yearlong mooring data were collected and analyzed to investigate recent behaviors of the Pacific-origin waters around the Chukchi Borderland (CBL). Ocean mooring data are available at three stations, CP13, CP14, and GAM2 where is southern, northern, and eastern parts of the Chukchi Plateau (CP), respectively.

- In August, anomaly of sea ice extent (SIE) has a negative correlation with that of PSW temperature whereas it has a positive correlation with that of WW salinity. This implies that inter-annual variation of PSW temperature plays an important role on the wind of sea ice melting and consequent ice melting has an influence on salinity reduction in the surface water layer. Anomaly of PSW T is correlated with anomaly of PSW salinity, whereas it is negatively correlated with anomaly of surface water salinity and positively correlated with anomaly of surface water temperature.

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