A huge mesoscale eddy observed in the Arctic Ocean

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Context

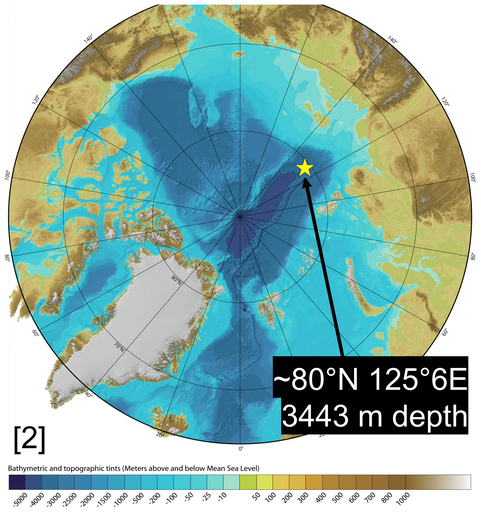
Ocean eddies are energetic vortex structures that transport the physical properties of water such as heat and salinity. The water trapped in eddies may travel with them up to thousands of kilometers from its origin and keep the properties of its origin. The Arctic Ocean is known to be inhabited with mesoscale eddies commonly detected between 200 m and 1200 m depths. Eddies may considerably affect the vertical structure of the water column in the Arctic Ocean.

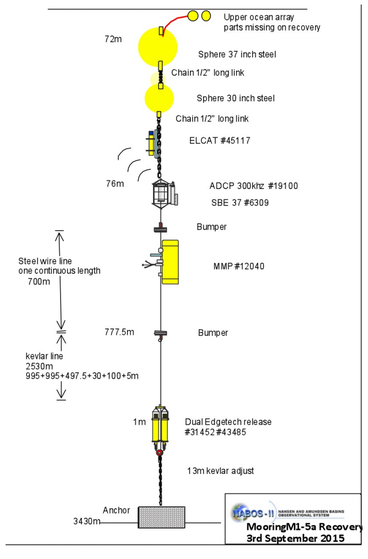
Objectives

This study aims to investigate a huge eddy-like structure detected at one of the Nansen and Amundsen Basin Observational System (NABOS) mooring stations located at the continental slope in the Laptev Sea (2013-2015).

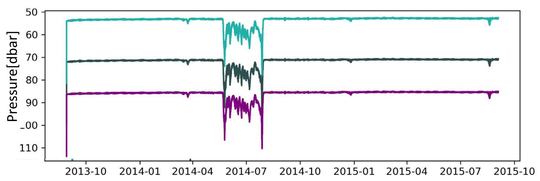
Materials & Methods

- The study is based on the analysis of the mooring records freely available online [1].
- Temperature and salinity measurements: 1) fixed-depths CTDs, 2) SBE-37s (“microCATs”), current measurements: 3) upward-looking bottom-tracking ADCP, 4) MMP.
- Analysed: time series of temperature, salinity, density, currents velocities, spectrums of currents velocities.

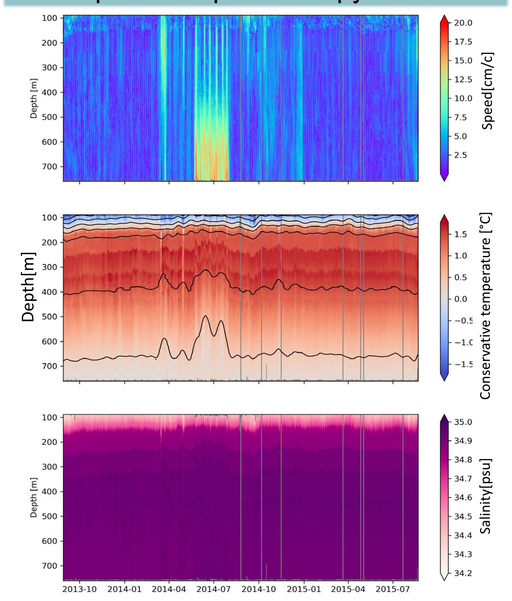




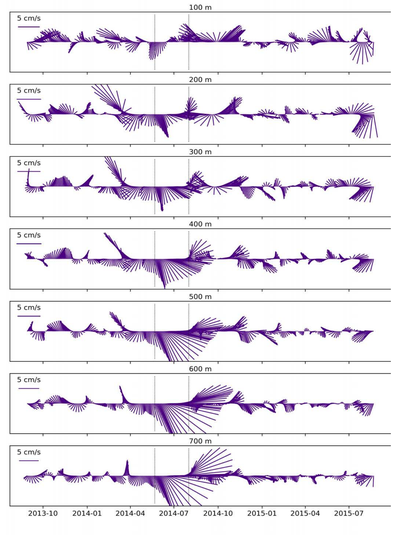
The eddy induced strong current and tilted the instruments



Strong currents below 500 m and upward displaced isopycnals



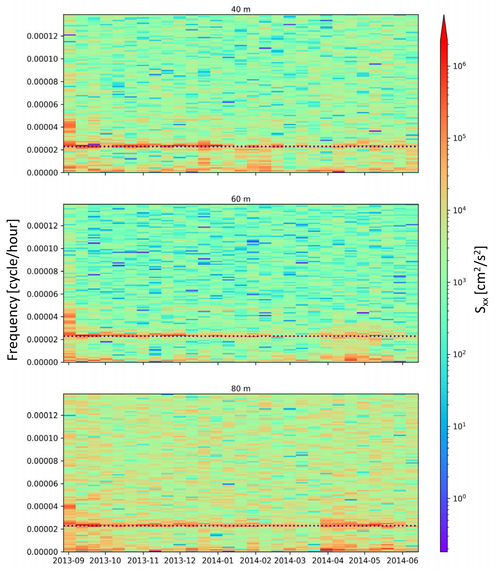
Eddy approached from the West



Results

- Anticyclonic eddy with the core located deeper than 700 m.
- Cold and saline (denser).
- Isopycnals in the upper water column experienced vertical displacement of up to 170 m.
- Signs of eddy are evident up to 250 m depth (more than 500 m up from the core).
- The eddy did not enhance inertial oscillation spectrum in the upper water column.
- The eddy approached the mooring from the West.

Inertial oscillation frequency during the eddy passage is not pronounced at the velocity spectra



Conclusions

- The eddy pushed up warm Atlantic Water layer closer to the surface that may affect the cold Arctic halocline protecting the surface water and sea ice from Atlantic warmth
- Observed eddy is larger than those usually observed in the Eurasian Basin of the Arctic Ocean
- Analysis of its T-S diagram may provide the information on its origin
- The velocity spectra at the frequency of inertial oscillation (usually pronounced in the upper ocean) was not impacted by the deep eddy

References:

1. *Igor Polyakov.* 2016. NABOS II - Mooring Data 2013 - 2015. Arctic Data Center. doi:10.18739/A2W669897.
2. *Jakobsson, M., L. A. Mayer, B. Coakley, J. A. Dowdeswell, S. Forbes, B. Fridman, H. Hodnesdal, R. Noormets, R. Pedersen, M. Rebesco, H.-W. Schenke, Y. Zarayskaya A, D. Accettella, A. Armstrong, R. M. Anderson, P. Bienhoff, A. Camerlenghi, I. Church, M. Edwards, J. V. Gardner, J. K. Hall, B. Hell, O. B. Hestvik, Y. Kristoffersen, C. Marcussen, R. Mohammad, D. Mosher, S. V. Nghiem, M. T. Pedrosa, P. G. Travaglini, and P. Weatherall, The International Bathymetric Chart of the Arctic Ocean (IBCAO) Version 3.0, Geophysical Research Letters, doi: 10.1029/2012GL052219.*