Activity during the 8 months

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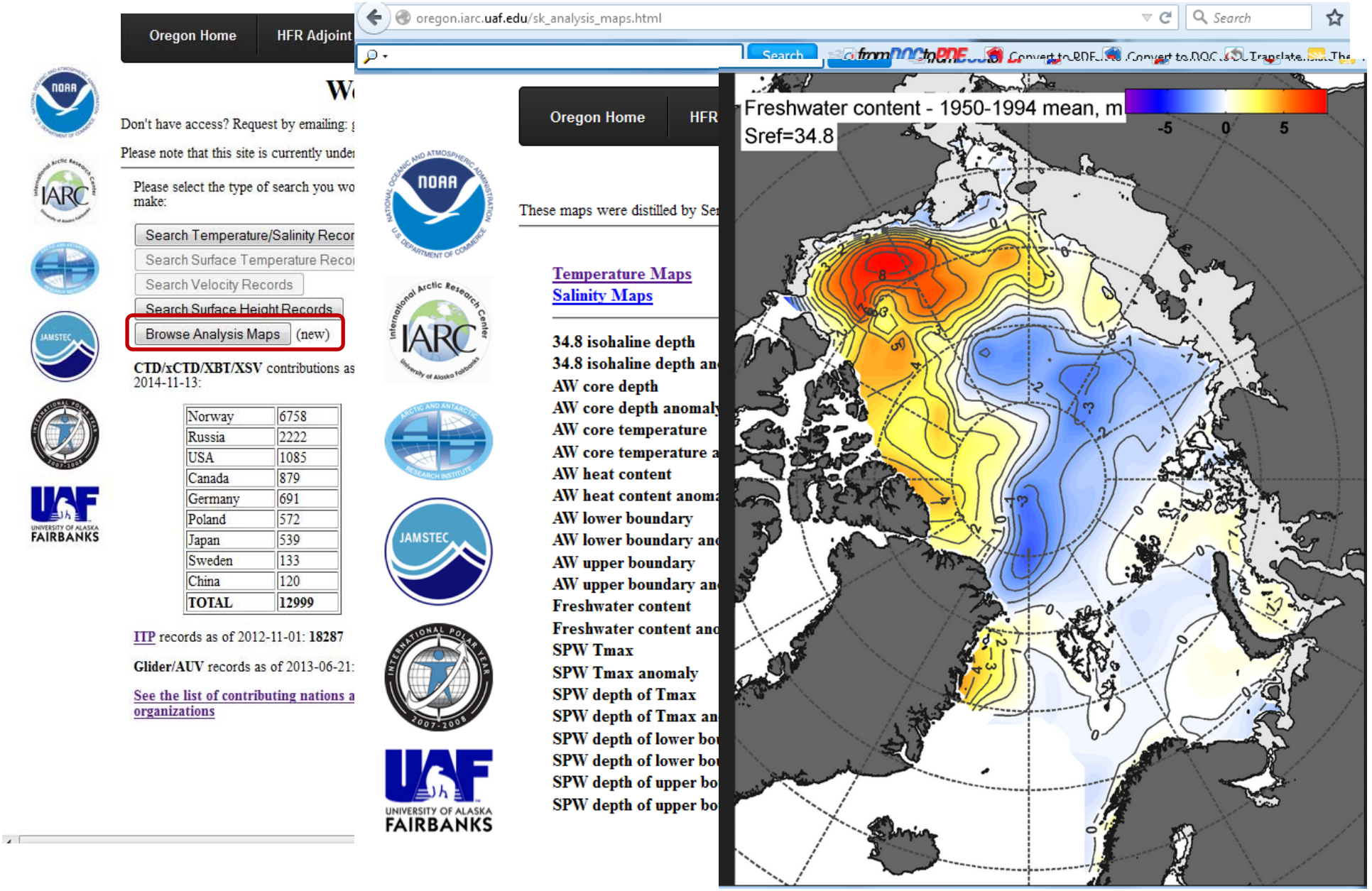
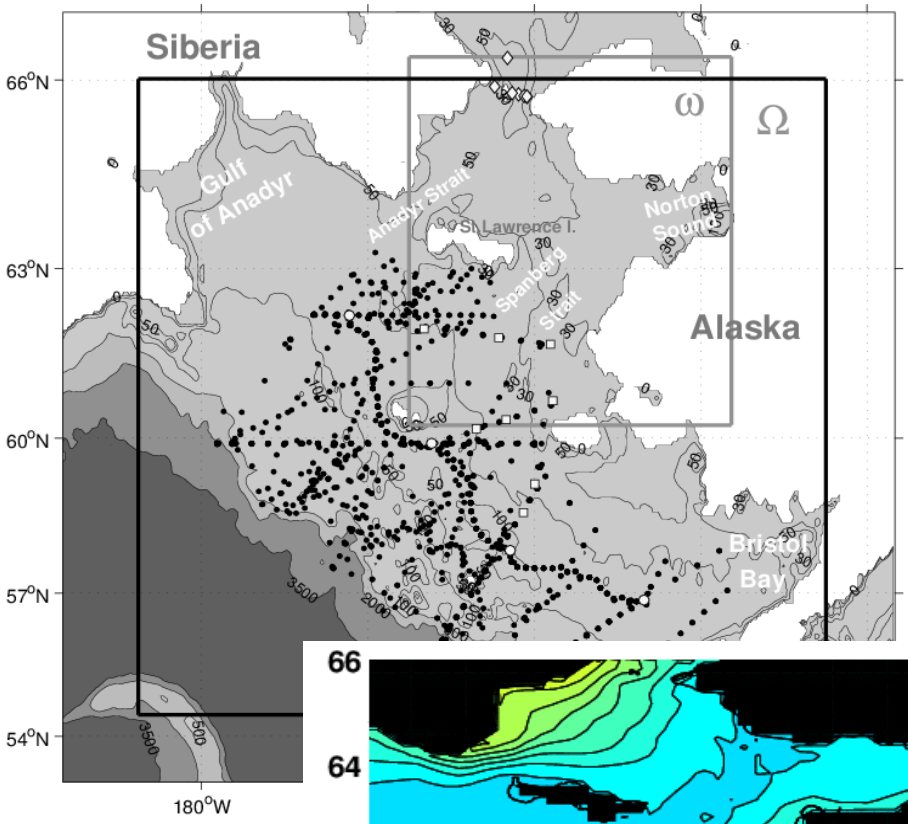
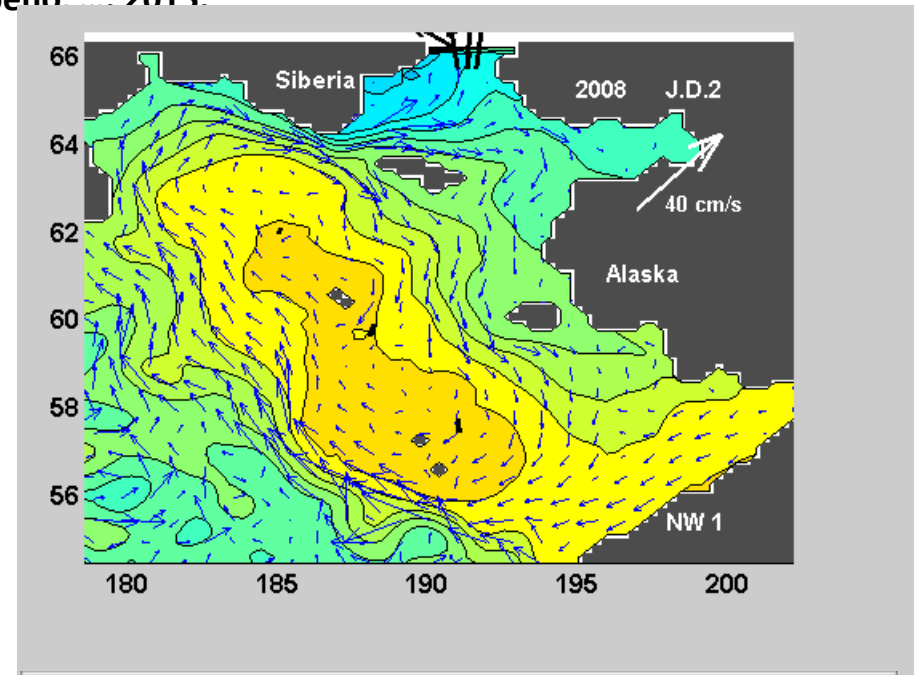
International Polar Year Database: 2007-2010

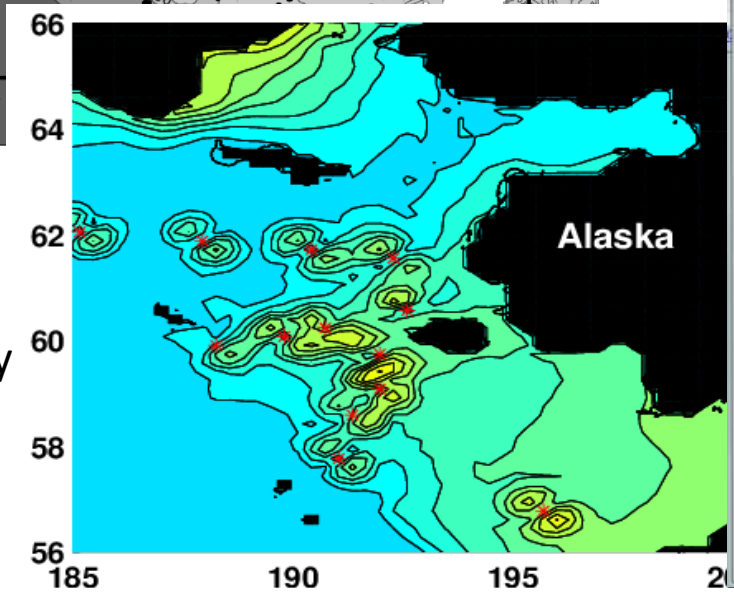


4 year reanalysis of the Bering Sea: 2007-2010

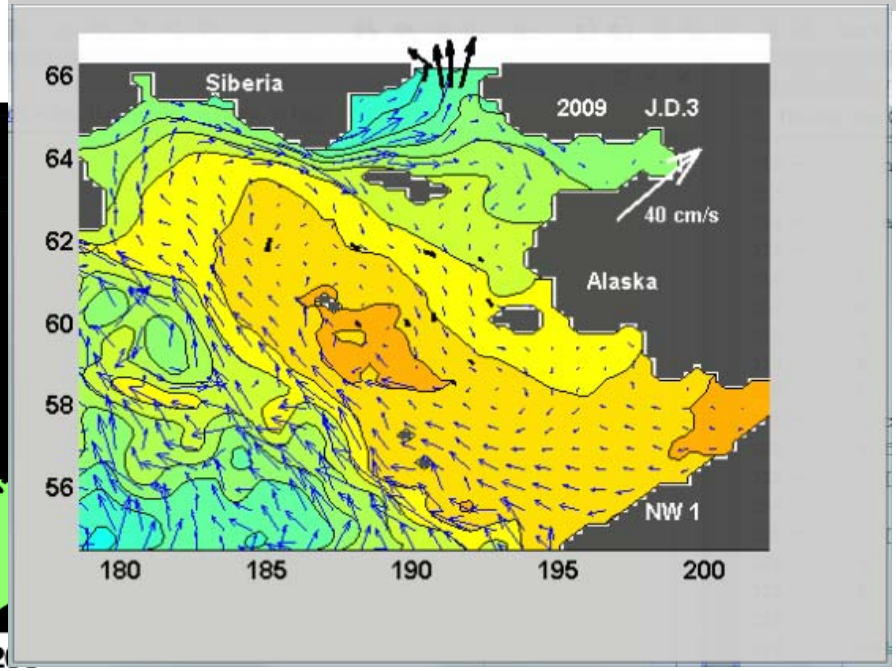
Manuscript in preparation: Panteleev, Yaremchuk, Francis, Stabeno, ... 2015.



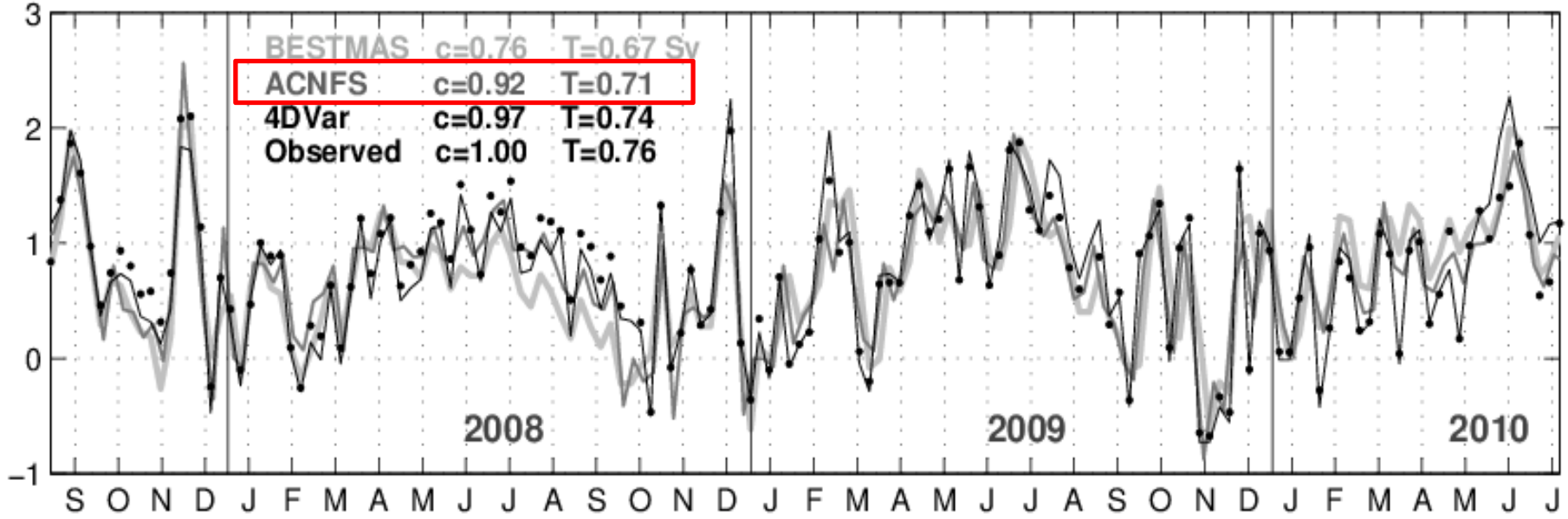




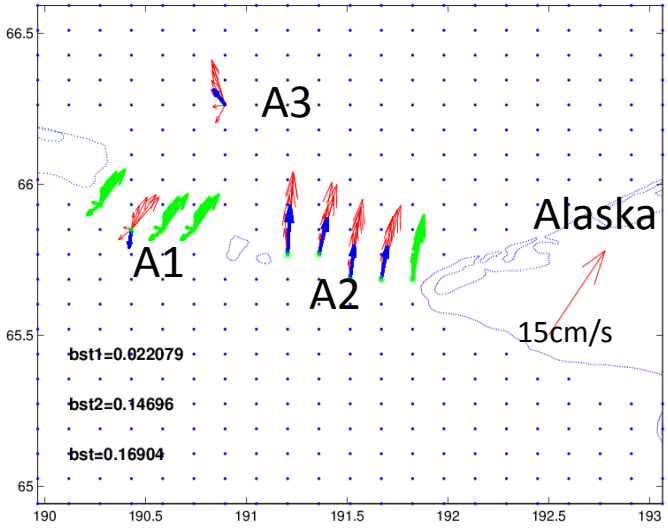
Adjoint Sensetivity analysis

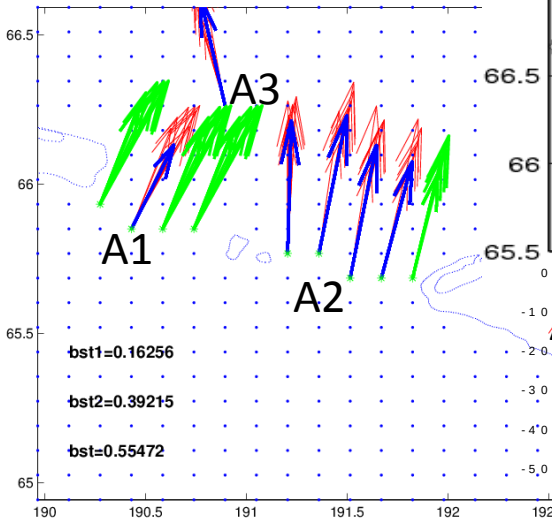


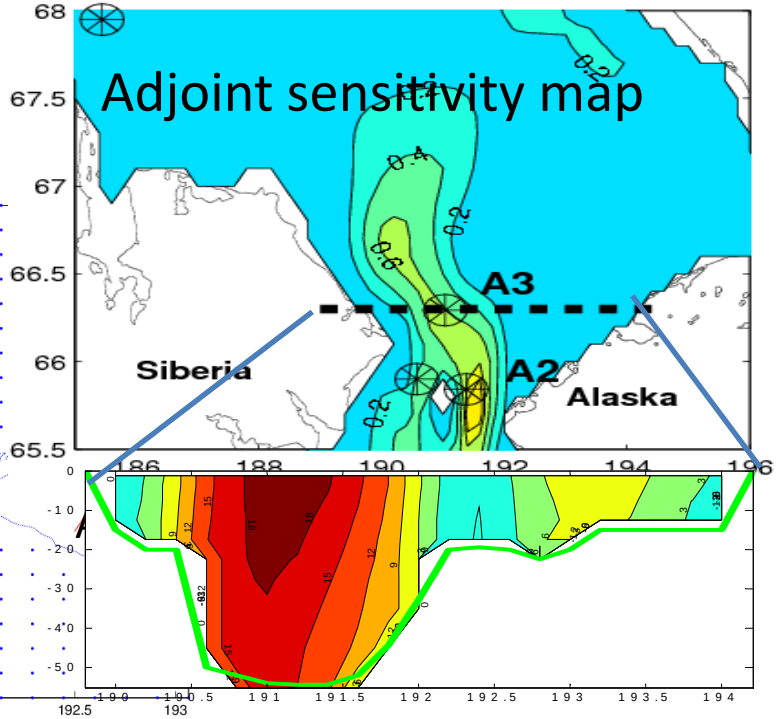
Bering Strait transport:



Weekly averaged Correlation(V_{A3}, BST) =0.96-0.98;
Weekly averaged Correlation(V_{A2}, BST) =0.98-0.99;

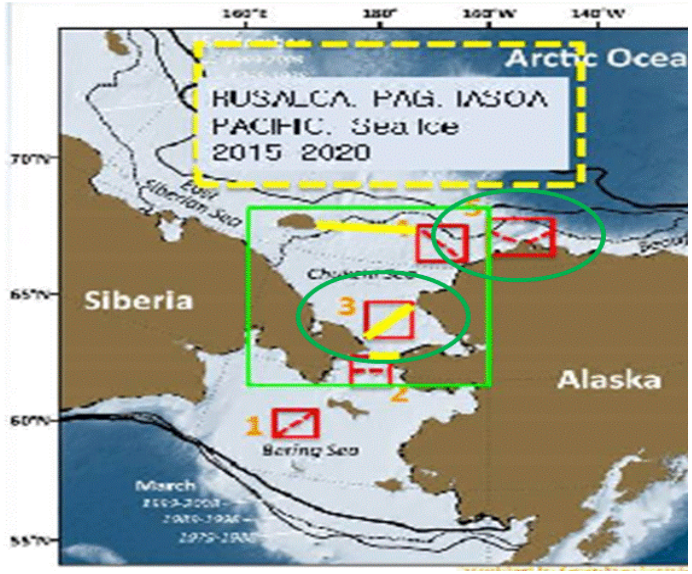




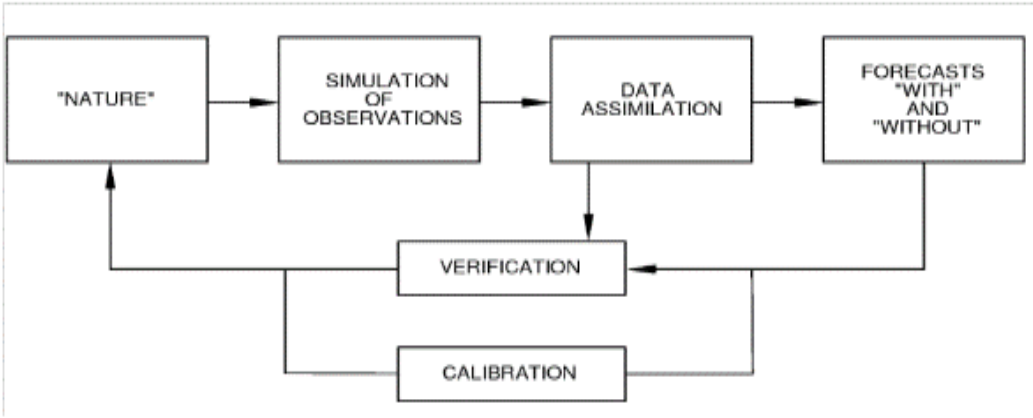


Passive tracer (biological) sampling

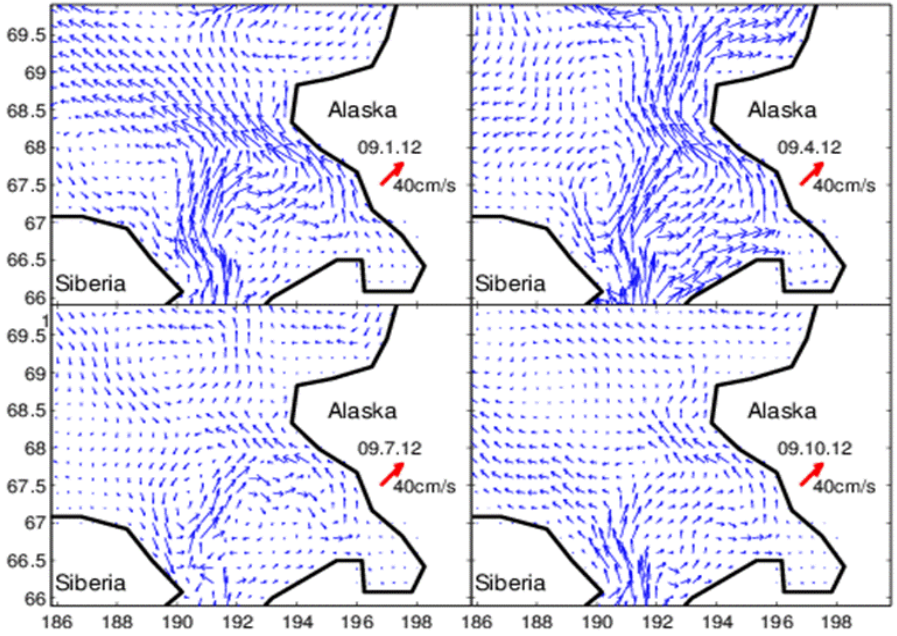
Area of interest

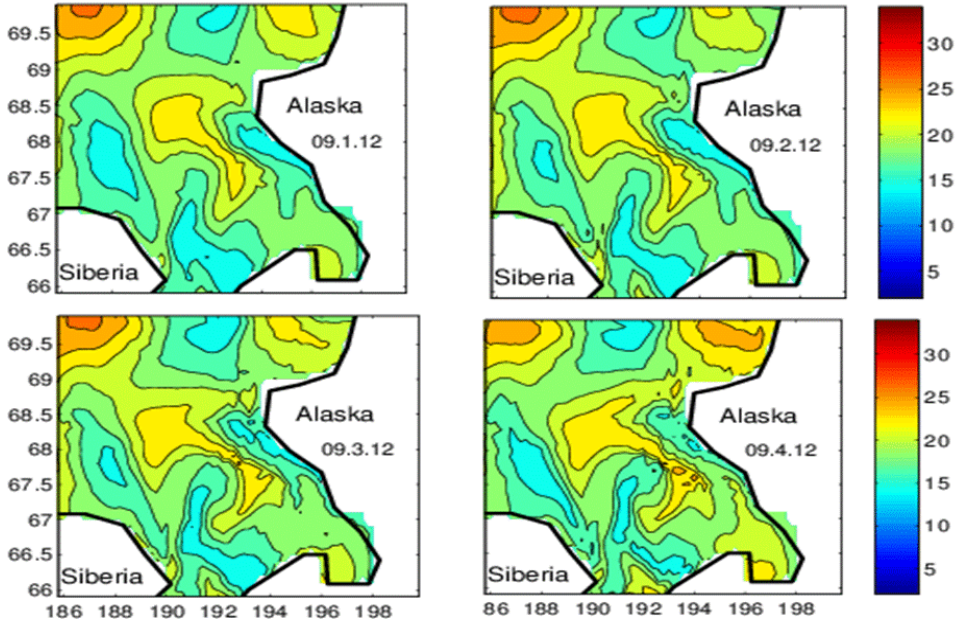


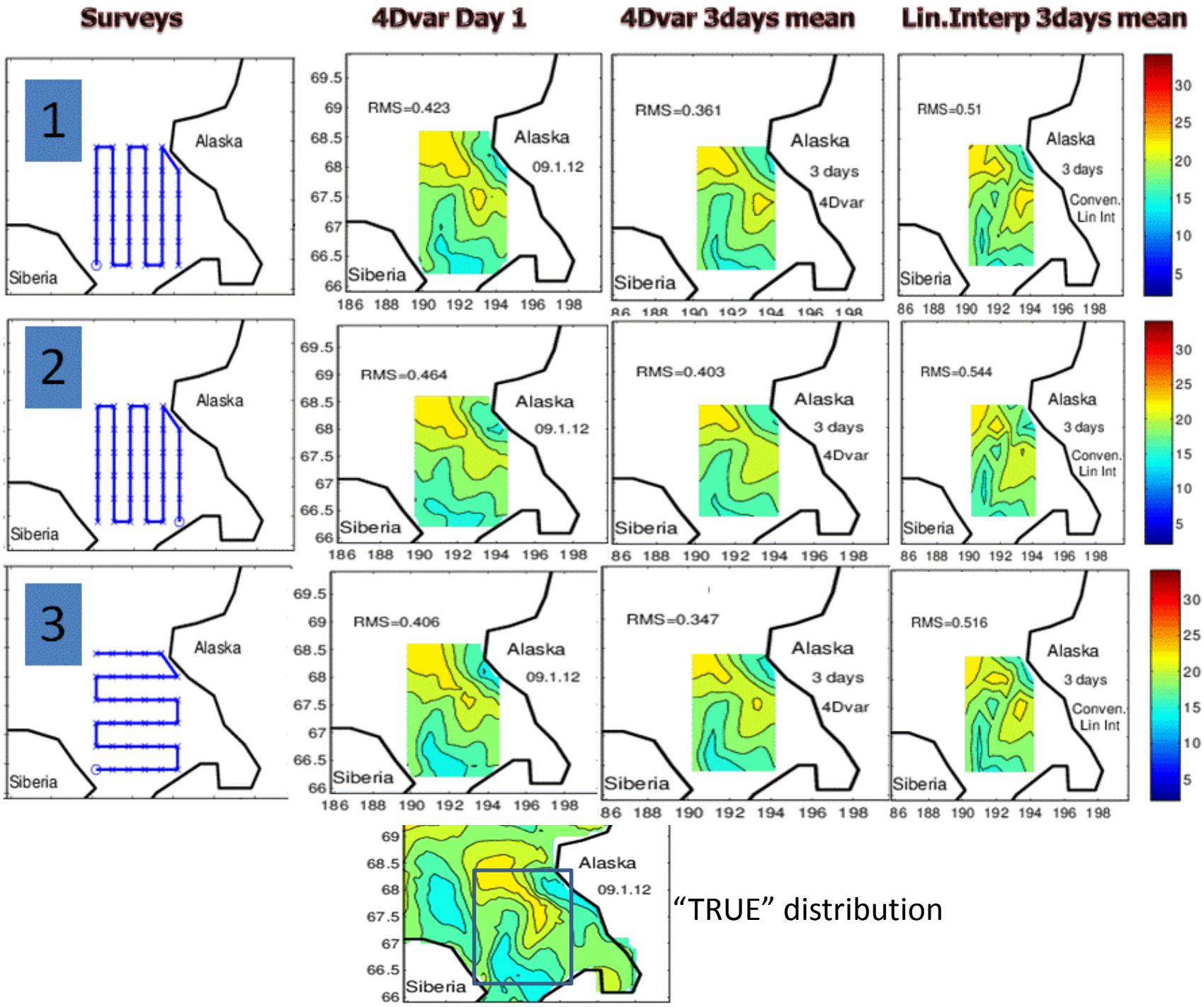
Observing System Simulation Experiments



Velocity field was derived through the assimilation HFR's and mooring data:






Surveys
4Dvar Day 1
4Dvar 3days mean
Lin.Interp 3days mean
1
2
3
Alaska
Siberia
RMS=0.423
RMS=0.361
RMS=0.51
RMS=0.464
RMS=0.403
RMS=0.544
RMS=0.406
RMS=0.347
RMS=0.516
09.1.12
3 days
4Dvar
Conven.
Lin Int
"TRUE" distribution

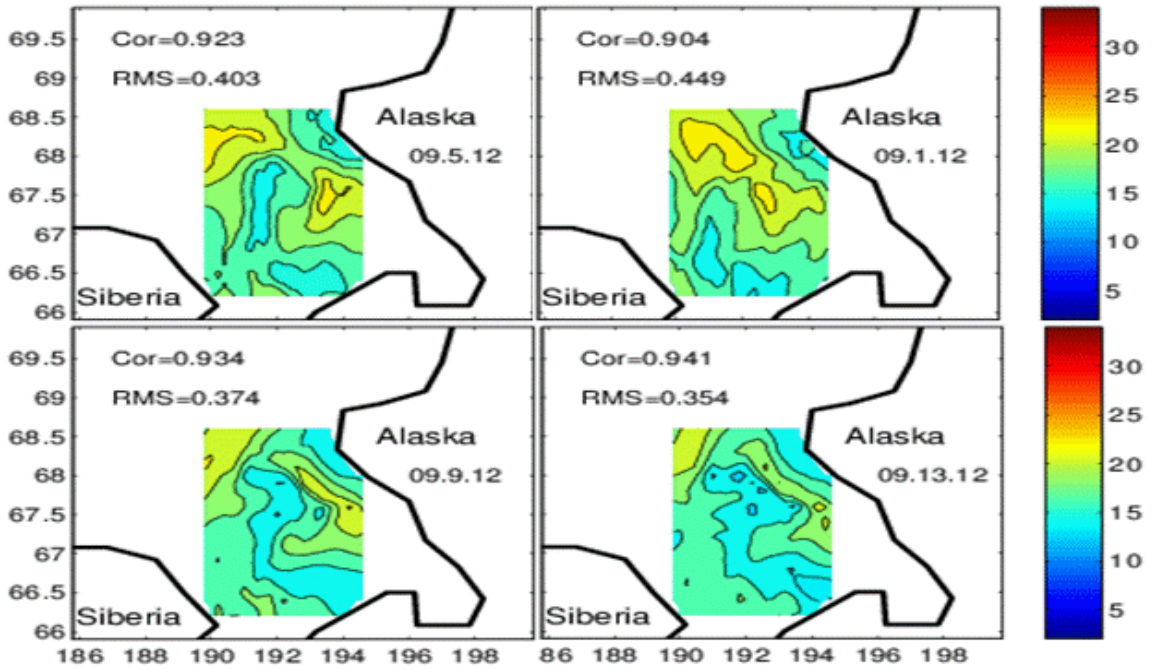
The 4Dvar advection-diffusion model

The *Advection-Diffusion Biological Tracer Model (ADBTM)* is based on modified advection-diffusion equations which are the part of SIOM. Currently ADBTM includes exponential mortality/growth (m) and biological tracer horizontal and vertical (sinking) velocity (u_B, v_B, w_B) and fluxes F_{BO}, F_{BH} at the surface and at the bottom:

$$\partial B/\partial t+(u+u_b)\partial B/\partial x+(v+v_b)\partial B/\partial y+(w+w_b)\partial B/\partial z=\Delta B+\partial^2 B/\partial z^2-mB$$

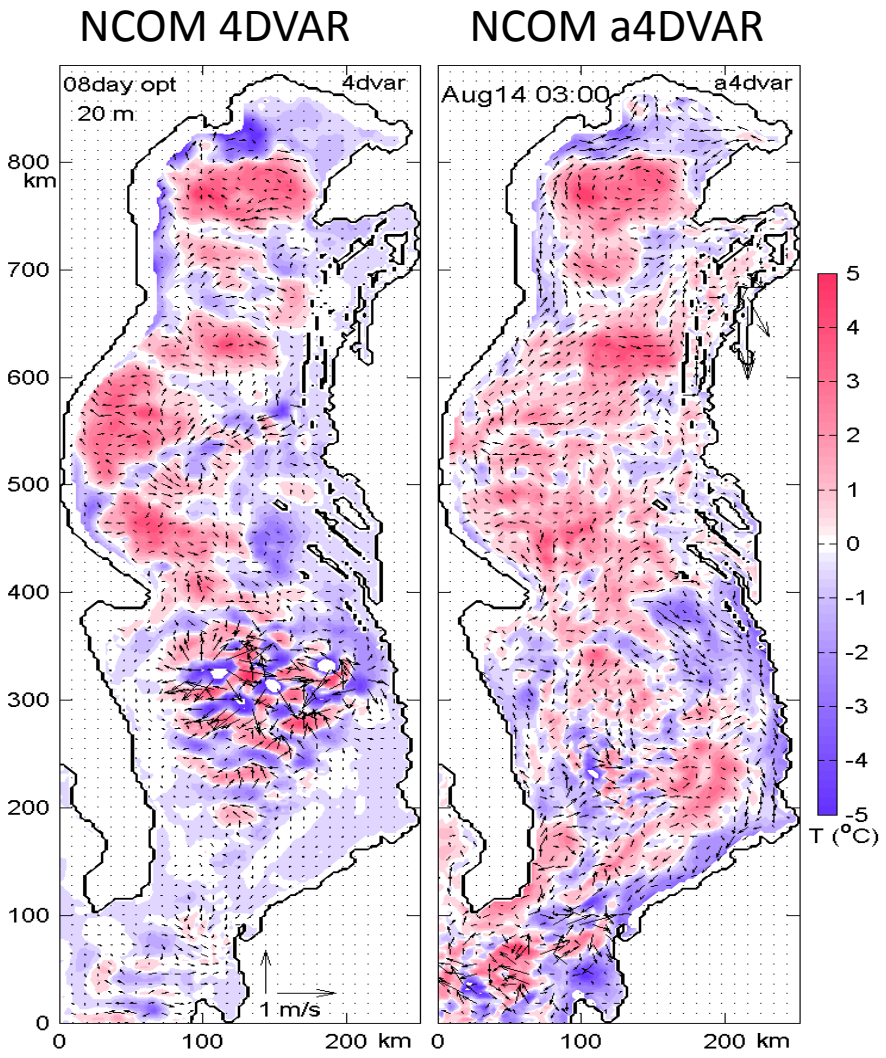
$$\partial B/\partial z=F_{B0}, z=0; \quad \partial B/\partial z=F_{BH}, z=H$$

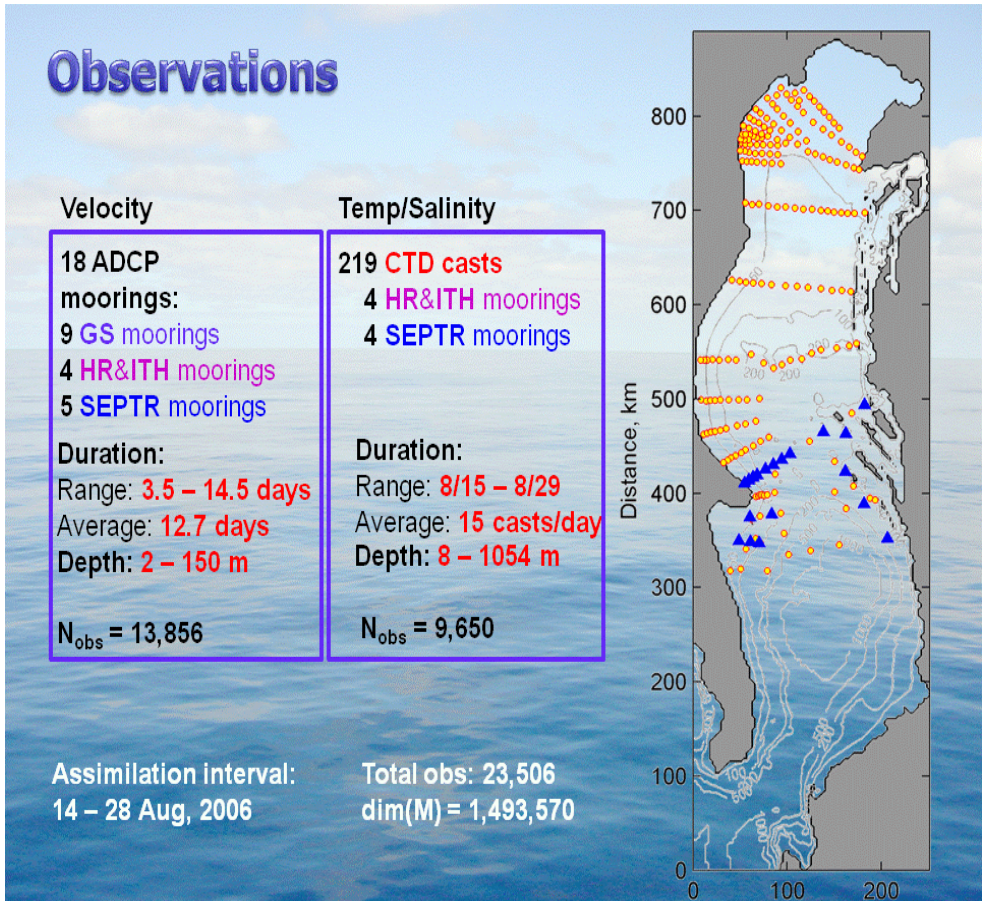
Estimation of the mortality coefficient

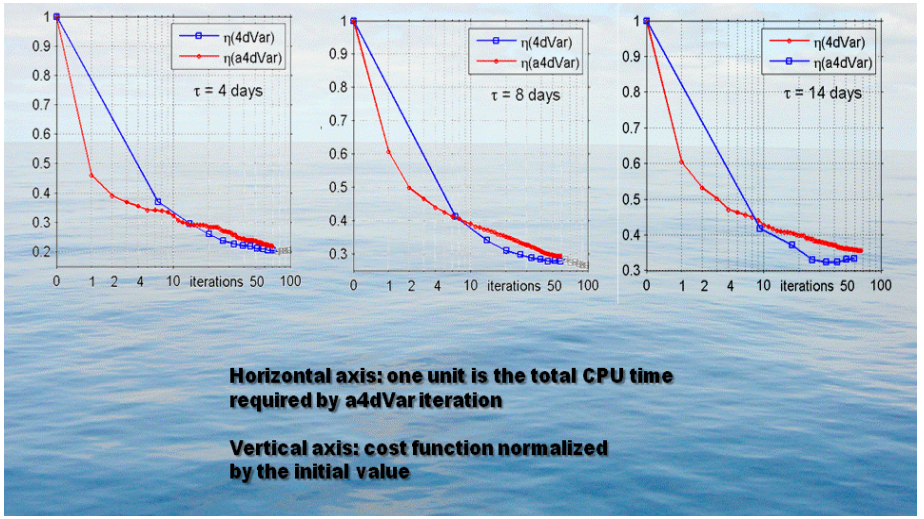


Formally mortality coefficient can be defined from two surveys separated by 1-2 week periods. Survey configuration 1, 3 and 4 were tested with respect of possibility to determine mortality coefficient (m) from 2 surveys separated by 7 day period and provided respectively $m_{optimized}$= *-1.29e-7, -1.33e-7, and -1.4e-7.* The conventional approach (fitting to exponent) provides m_{exp}=*-1.53 - -1.57e-7.* Figure below shows the reconstructed passive tracer evolution with $m_{optimized}$= *-1.29e-7* for the survey configuration #1.

Adjointless 4Dvar NCOM: extention to the ICE-HYCOM and ICE-ROMS







Conclusions:

1. SAON/NOAA International data base provide the one stop for CTD observations in the AO during 2008-2010. There is a strong need to continue this activity and develop PAG database.

2. 2007-2010 Northern Bering Sea reanalysis has been accomplished. The lessons from this study are:

a) preliminary adjont sensitivity analysis and OSSE help to increase the information content of the observation. That will result to the more accurate estimates of the ocean state
b) HYCOM ACNFS (3Dvar) provides very good estimates of the Bering Srait tansport and near surface circulation. It can be used as a first guess for the incoming Adjointless ROMS-HYCOM DAS'es

3. A4Dvar NCOM has been tested. A4Dvar ROMS-ICE, HYCOM-ICE is the next step.
4. Variational inversion of the biological observations using the passive traces allows to increase accuracy of the estimates of the biological parameters and mortality coefficient.