

A large red and white Canadian Coast Guard icebreaker ship is sailing on a blue body of water. The ship has a white hull with a red stripe and a red maple leaf on the funnel. It is surrounded by a vast expanse of water with small ice floes. In the background, there are snow-capped mountains under a clear blue sky. The ship's name 'Canada' is visible on the side, along with 'Garda Coast Guard' and 'Icebreaker'.

Somayeh Nahavandian<sup>1</sup>  
Louis Prieur<sup>2</sup>  
Yves Gratton<sup>1</sup>

1. INRS-Eau, terre et environnement, Quebec City, Canada  
2. Laboratoire d'Océanographie de Villefranche, France

Photo: Martin Fortier, ArcticNet

The bottom left corner contains two logos. On the left is the 'Malina' logo, featuring a stylized sun and the text 'Malina Sun goddess of Inuit'. On the right is the 'Canadian Arctic Shelf Exchange Study' logo, featuring a stylized blue arrow and the text 'Canadian Arctic Shelf Exchange Study'.

Canadian  
Arctic  
Shelf  
Exchange  
Study

# Presentation Plan

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- Region of study and database
- Objectives
- Methodology
- Results
- Conclusions

# Arctic Ocean

## ❖ Connections

### ➤ Pacific Ocean:

Bering Strait

### ➤ Atlantic Ocean:

Fram Strait &  
Canadian archipelago

## ❖ Circulation

### ➤ Beaufort Gyre :

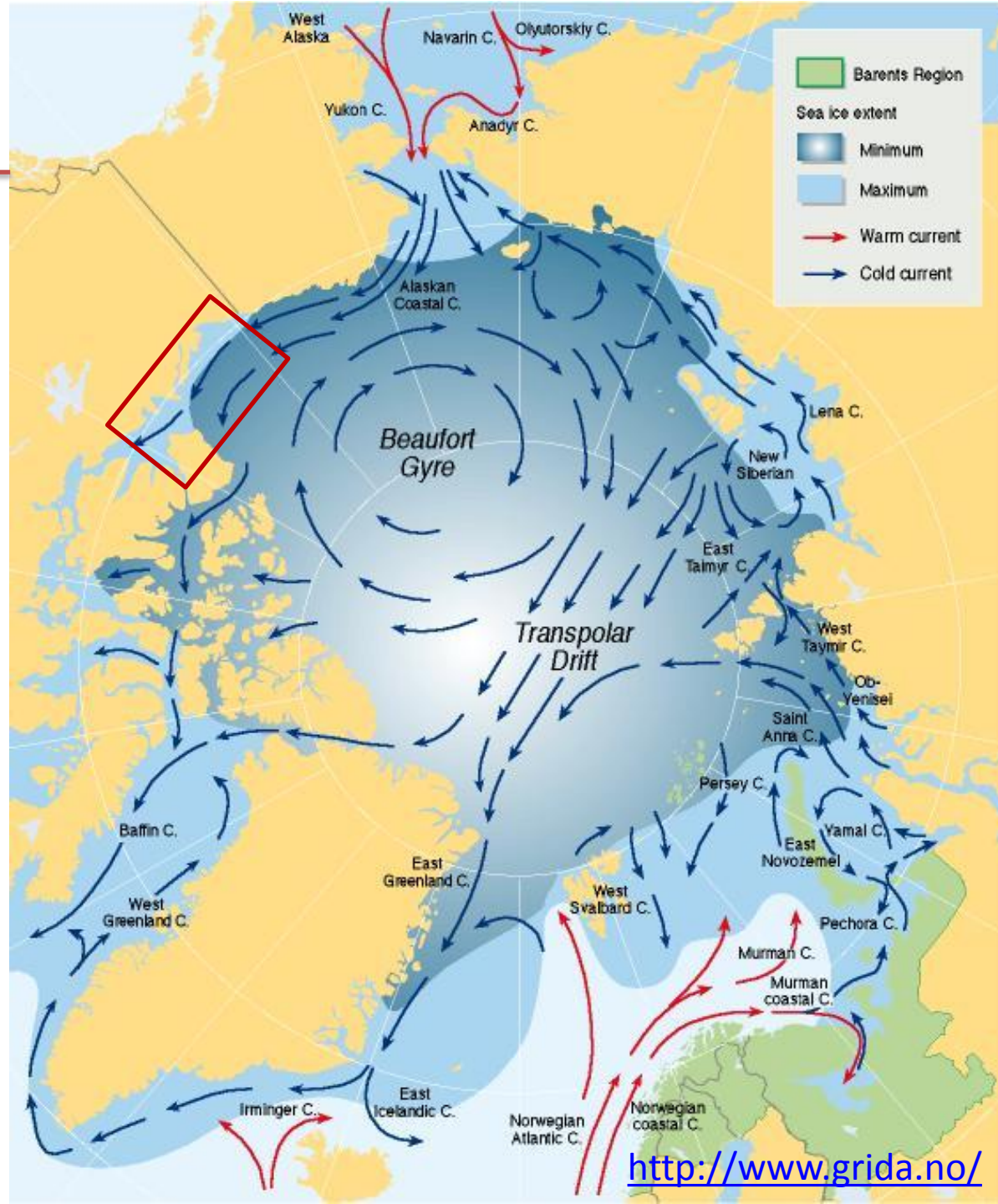
Anticyclonic Mack. offshore

### ➤ Beaufort Undercurrent:

Cyclonic

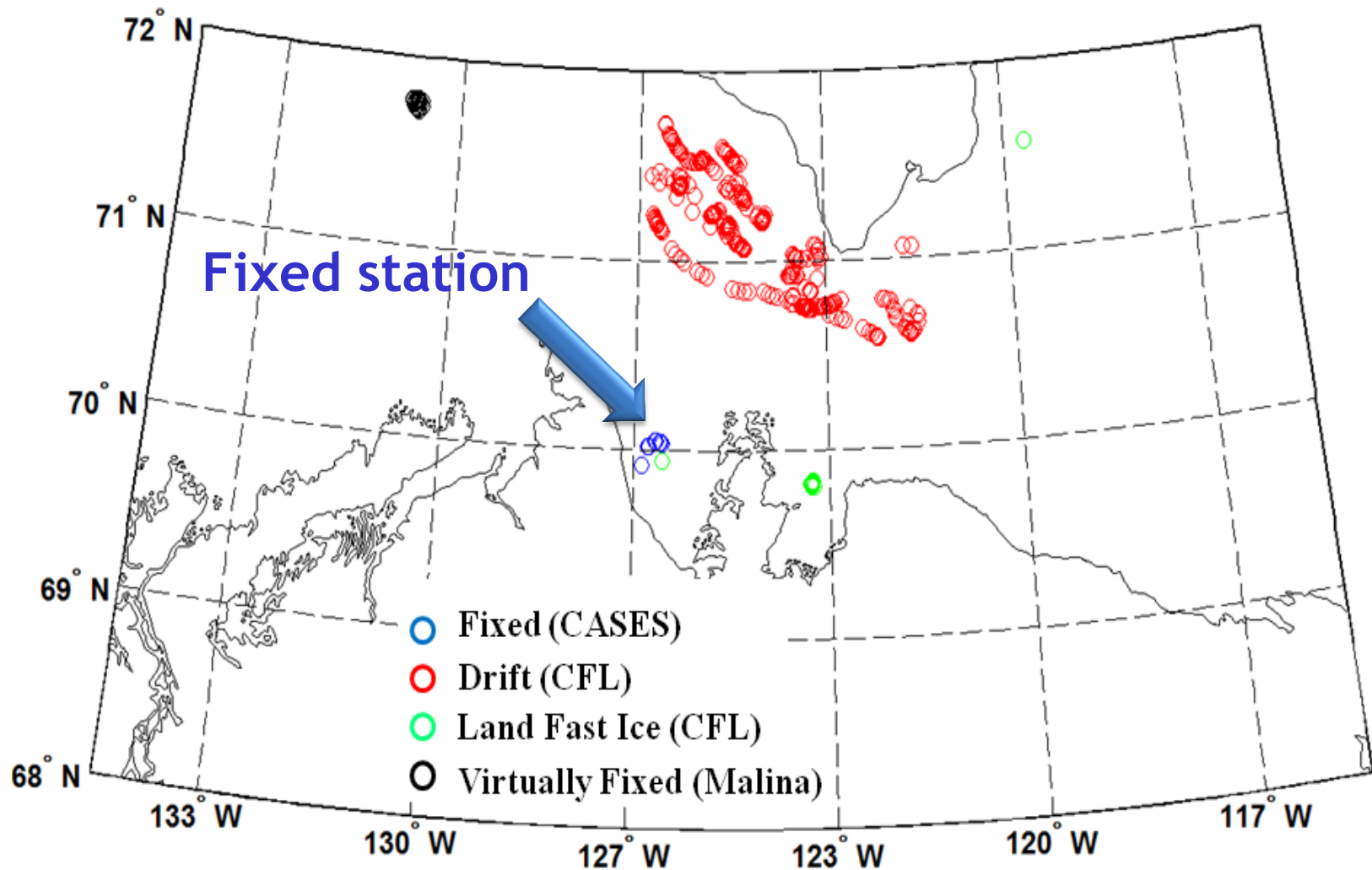
### ➤ Coastal Currents:

Cyclonic



# Databases

CASES: 09 Dec. 2003 - 30 May 2004



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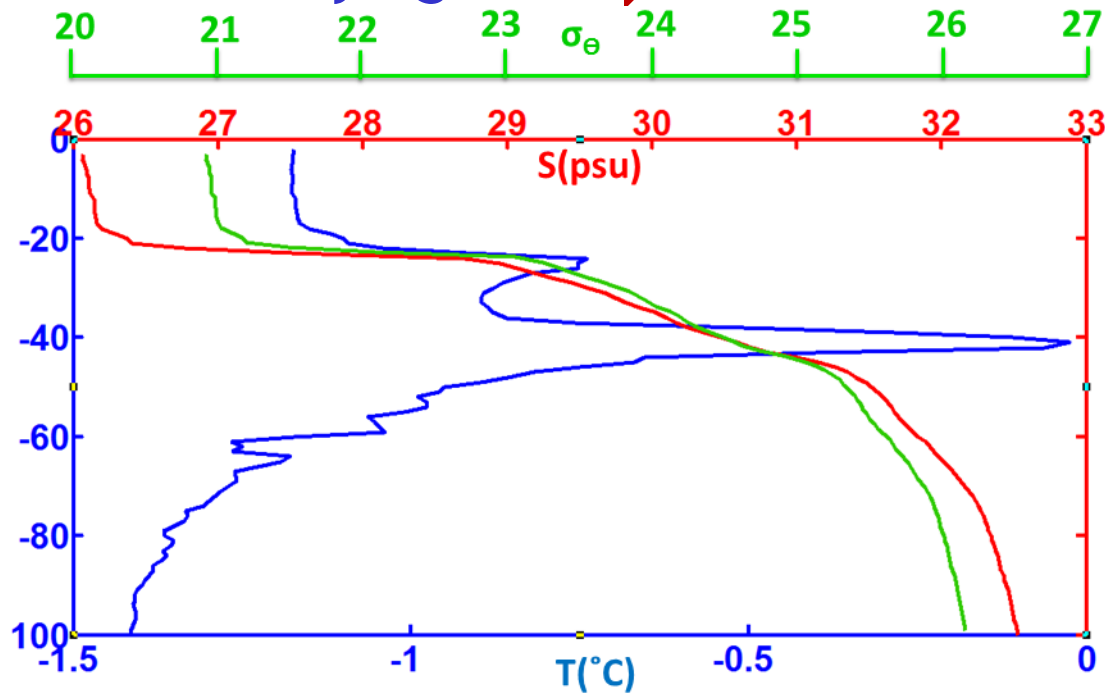
# Objectives

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- ❖ Annual and seasonal evolutions of MLD
- ❖ Interactions between the ocean fluxes and MLD using CTD profiles

# What is the mixed layer?

- Oceanic homogeneous surface layer
- Turbulence (wind, ice freezing)  MLD 
- Restratifying processes (Ice melting)  MLD 
- Turbulence + Restratifying  MLD



# Importance of the mixed layer

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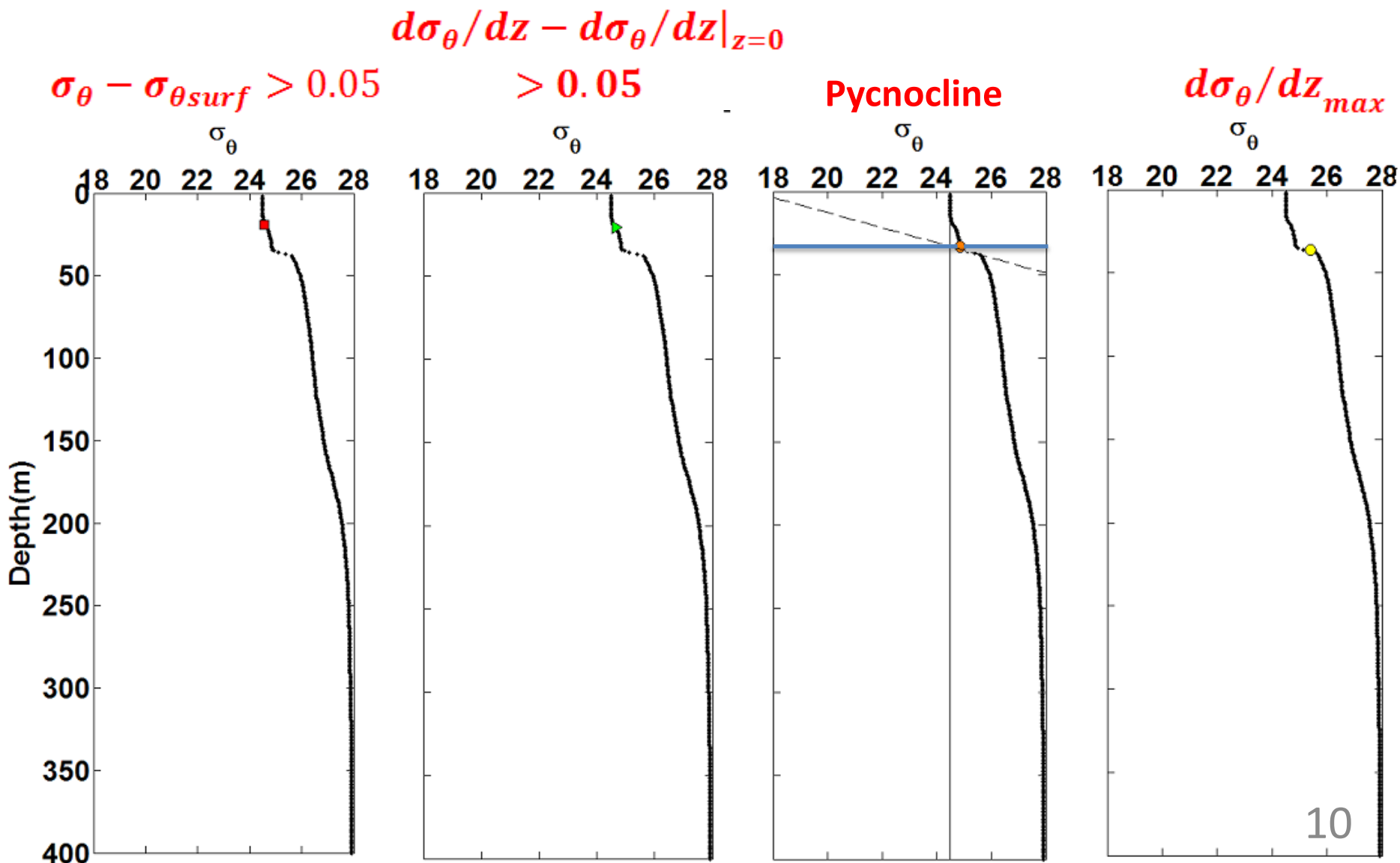
- ❖ Air – sea exchange
- ❖ Affects biological productivity by controlling the supply of nutrients for the phytoplankton

# Presentation Plan

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- Region of study and database
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  - MLD estimation technique
  - Mass flux model
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# MLD estimations



# Presentation Plan

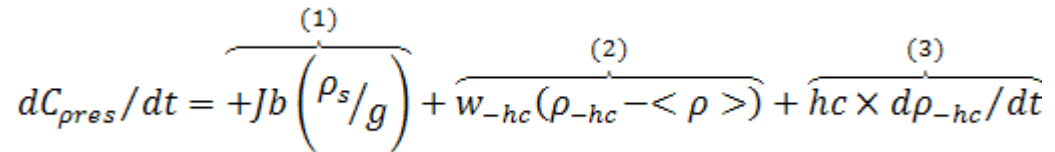
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## ***Emery (1976)***



***Prieur (2010)***



# Why this model?

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- ❖ Simple method

(Emery (1976) approach modified for the density)

- ❖ Using drifting (lagrangian) and fixed (eulerian) profilers.

- ❖ Vertical advection

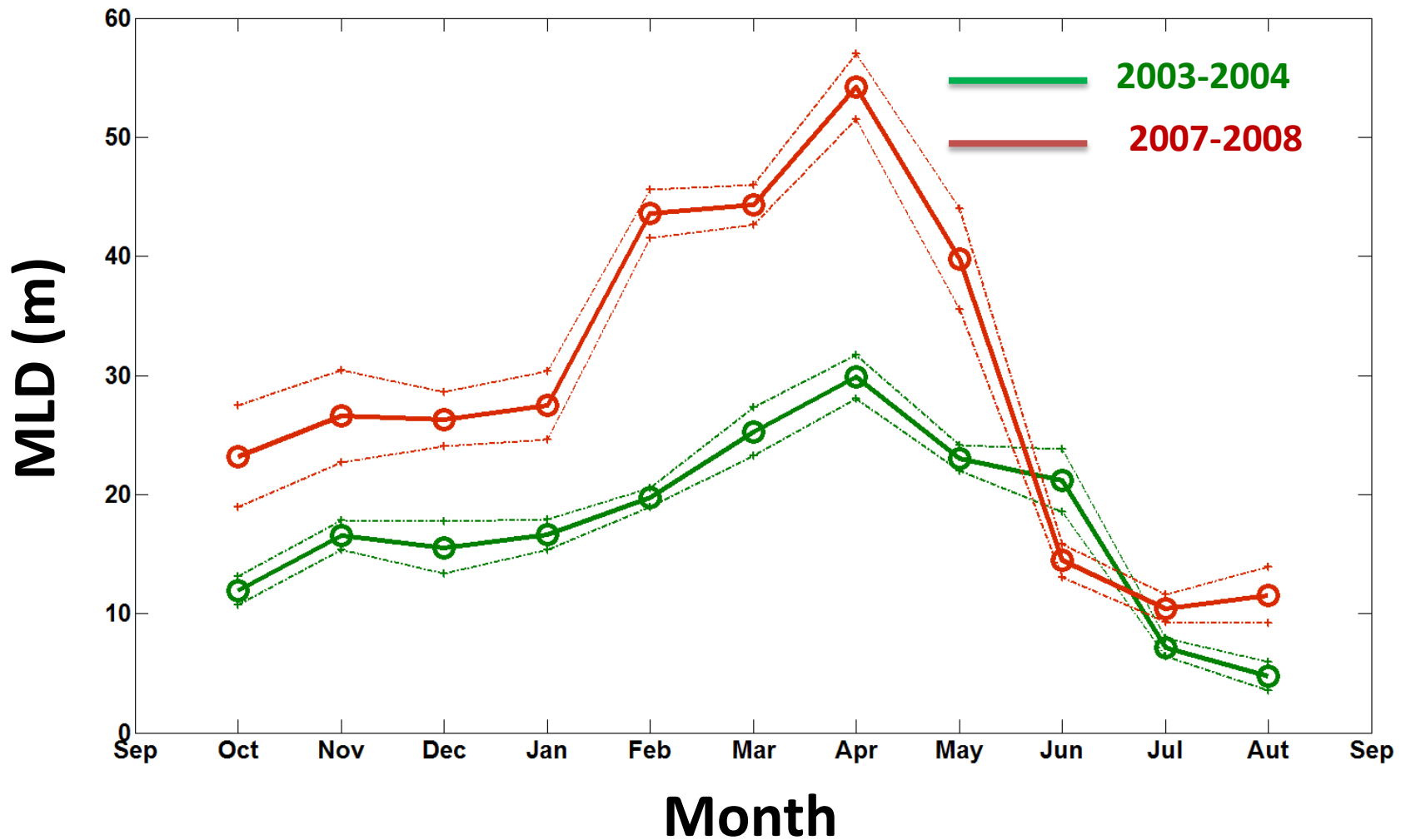
- ❖ Under ice atmospheric flux estimation

# Presentation Plan

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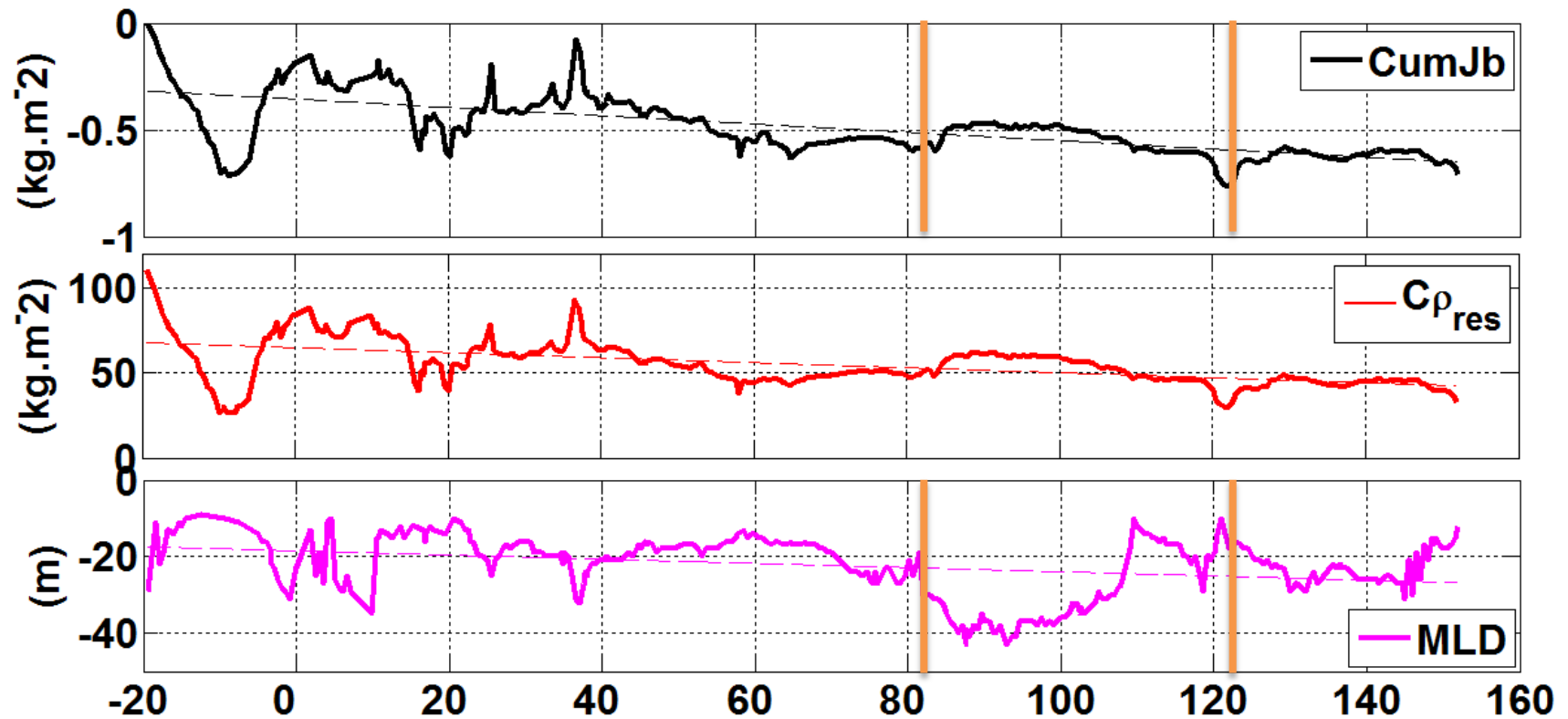
- Region of study and database
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# Mean MLD evolution

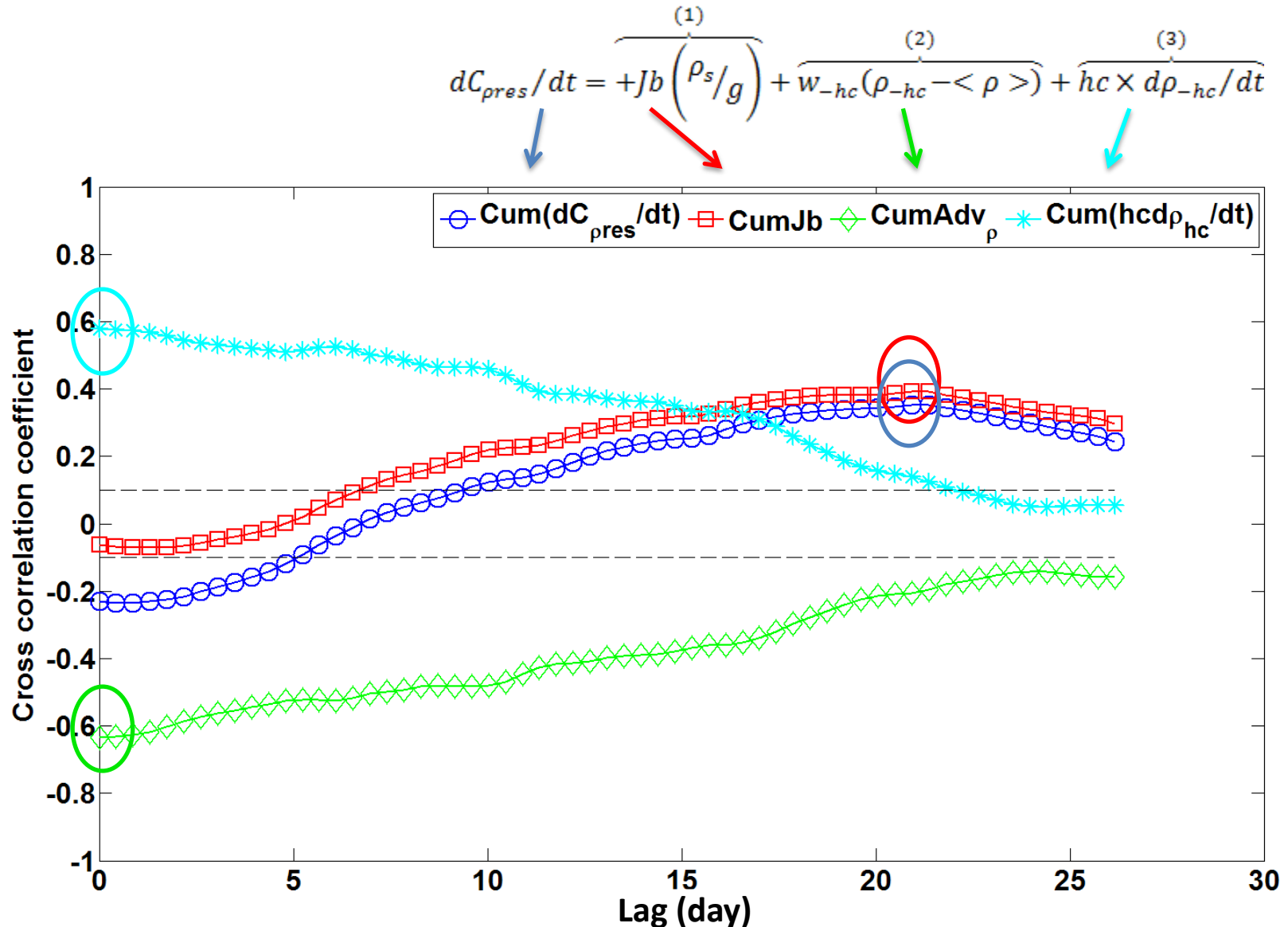


# Model results for the fixed station

$$dC_{pres}/dt = \overbrace{+Jb \left( \rho_s / g \right)}^{(1)} + \overbrace{w_{-hc} (\rho_{-hc} - \langle \rho \rangle)}^{(2)} + \overbrace{hc \times d\rho_{-hc}/dt}^{(3)}$$



# Cross-correlations



# Presentation Plan

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# Conclusions

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- MLD **increases** in winter and reaches to its **max** in spring
- **Increase** of MLD in 2007-2008
  - upwelling in fall 2007
  - Landfast ice (2003-2004)-  
mobile ice(2007-2008)
- Ocean flux model → simple & efficient
- MLD and estimated atmospheric flux under ice (CumJb) are correlated with **delay**
- Vertical advections has **Important** effect on MLD
  - ↑ MLD ↓
  - ↓ MLD ↑



# Thank you

