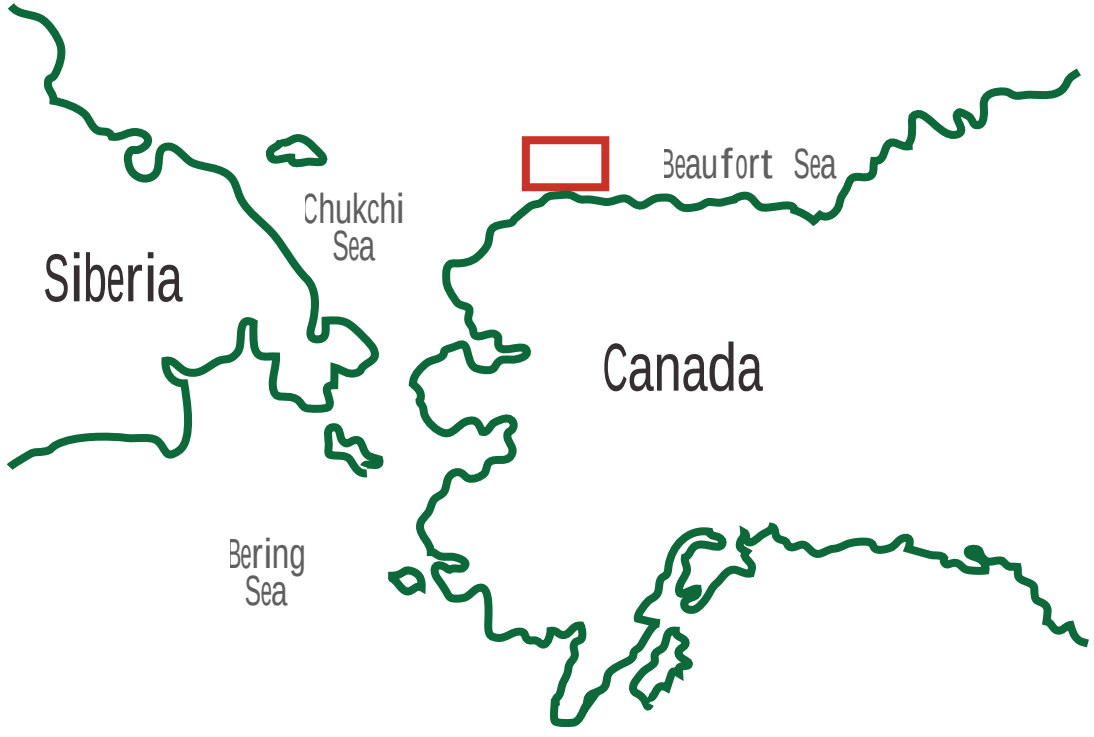
EVOLUTION OF WATER MASSES IN BARROW CANYON DURING SUMMER/FALL

FIRST RESULTS FROM THE DBO INTERNATIONAL TRANSECTS 2010-13

Carolina Nobre, *Bob Pickart, Kevin Arrigo, Carin Ashjian, Jingfeng He, Jackie Grebmeier, Motoyo Itoh, Svein Vagle, Catherine Berchok, Phyllis Stabeno, Takashi Kikuchi , Lee Cooper, Ian Hartwell*



OUTLINE

FIRST RESULTS FROM THE DBO INTERNATIONAL TRANSECTS 2010-13

WHAT IS DBO?

THE PROGRAM AND SCOPE OF THE DATA

MEAN FIELDS & SEASONALITY

ASSESSING SEASONAL VARIATION IN WATER MASSES AND WIND FORCING

MESO-SCALE VARIABILITY

UPWELLING EVENTS

WHAT IS DBO?

THE PROGRAM AND SCOPE OF THE DATA

MEAN FIELDS & SEASONALITY

ASSESSING SEASONAL VARIATION IN WATER MASSES AND WIND FORCING

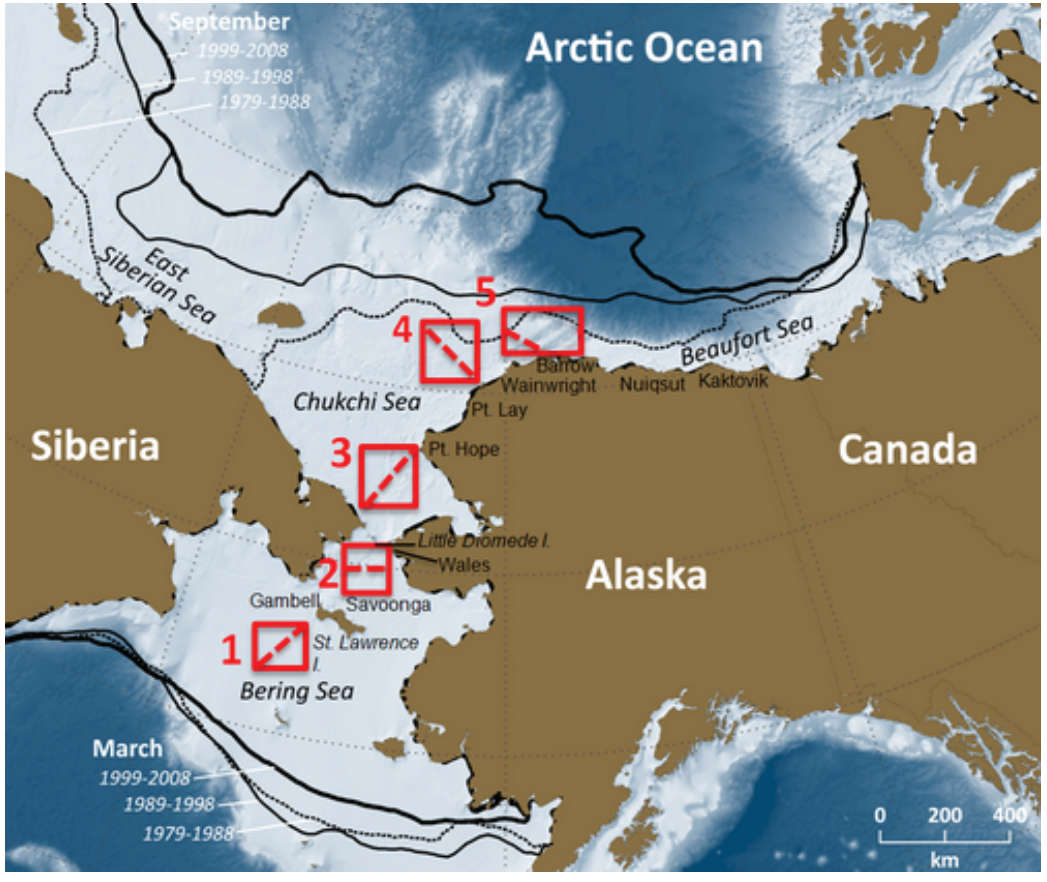
MESO-SCALE VARIABILITY

UPWELLING EVENTS

Distributed Biological Observatory

The DBO aims to serve as a change detection array for the identification and consistent monitoring of biophysical responses.

Occupied by national and international entities (shared data plan)

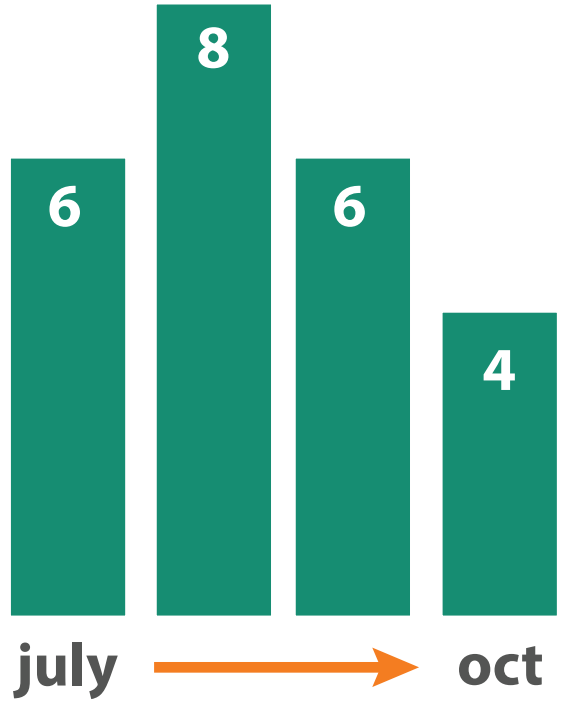


24 occupations of the Barrow Canyon transect

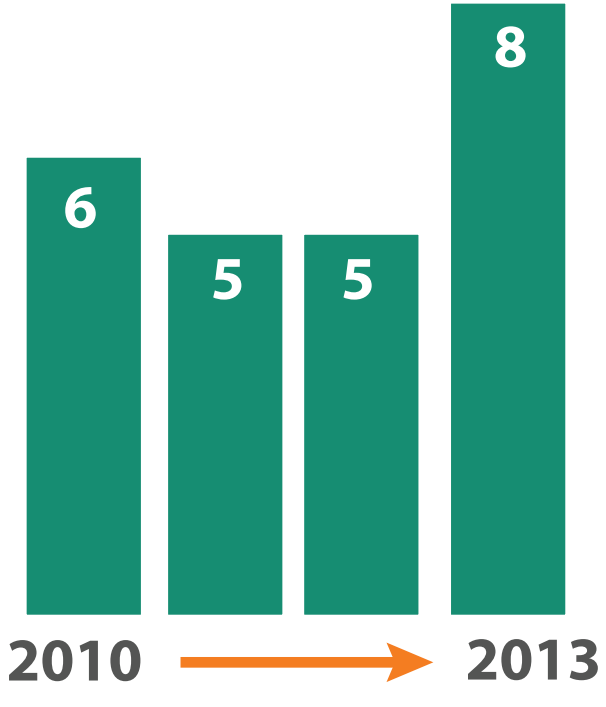
11 contributing Chief Scientists

202 total CTD casts

24 Occupations of Barrow Canyon Section from 2010- 2013

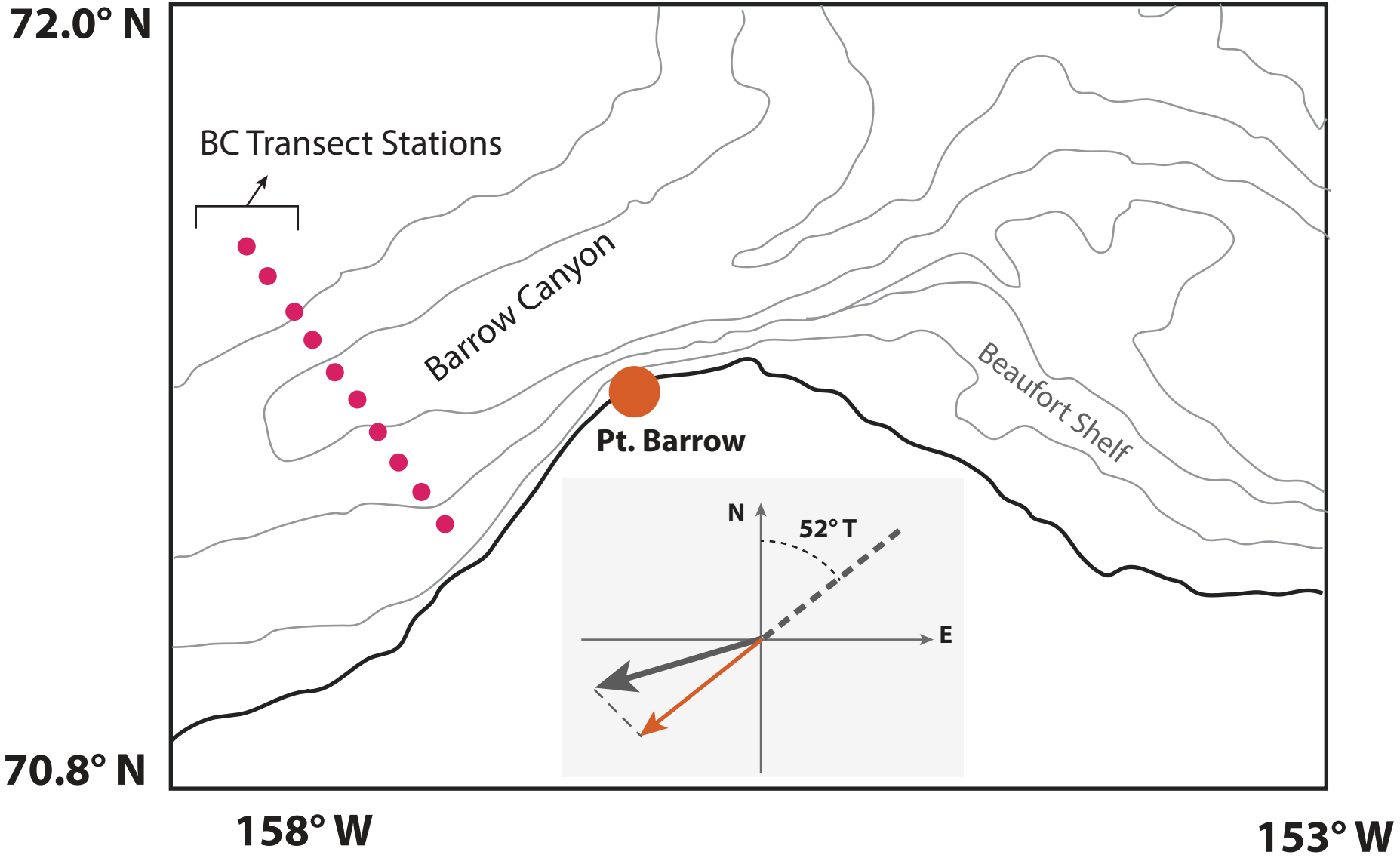


Seasonal



Yearly

Barrow Canyon Station Positions and Wind Data



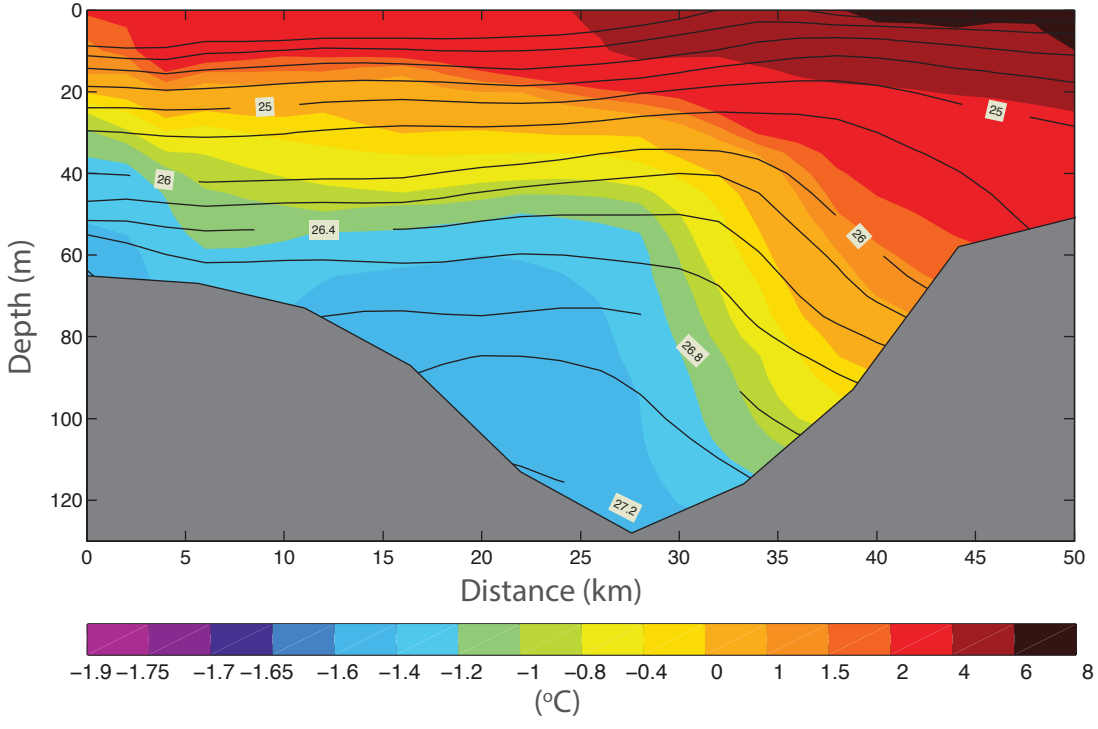
WHAT IS DBO?
THE PROGRAM AND SCOPE OF THE DATA

MEAN FIELDS & SEASONALITY
ASSESSING SEASONAL VARIATION IN WATER MASSES AND WIND FORCING

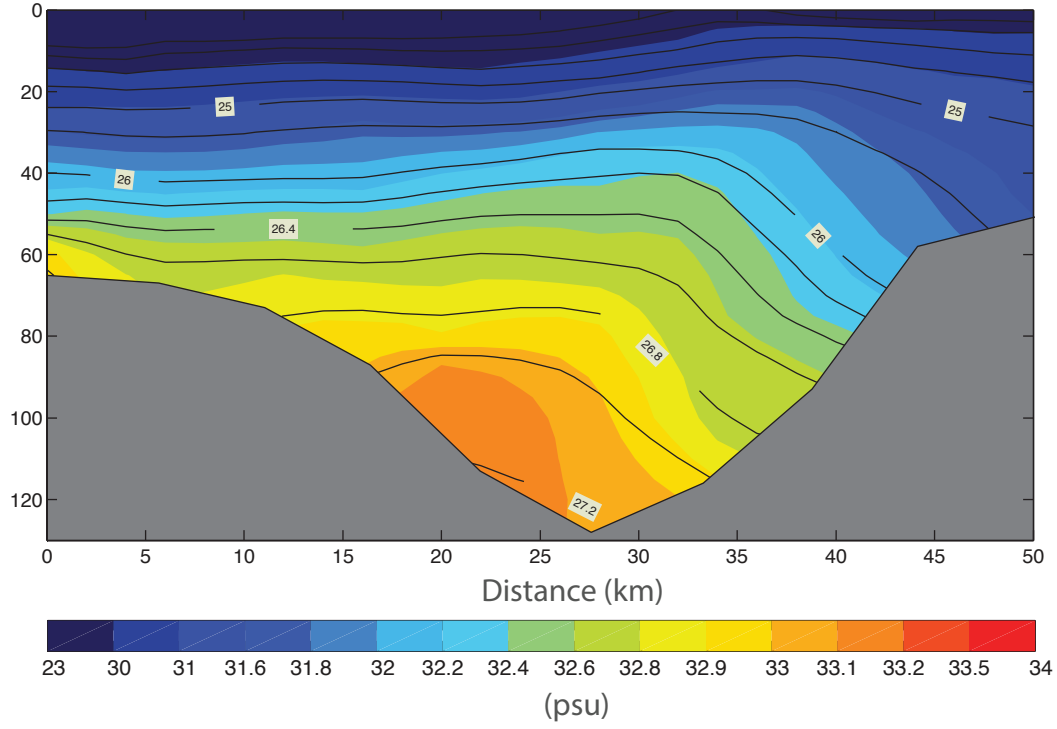
MESO-SCALE VARIABILITY
UPWELLING EVENTS

Mean Temperature and Salinity Fields for Barrow Canyon

Potential temperature (color) overlain by potential density (contours)

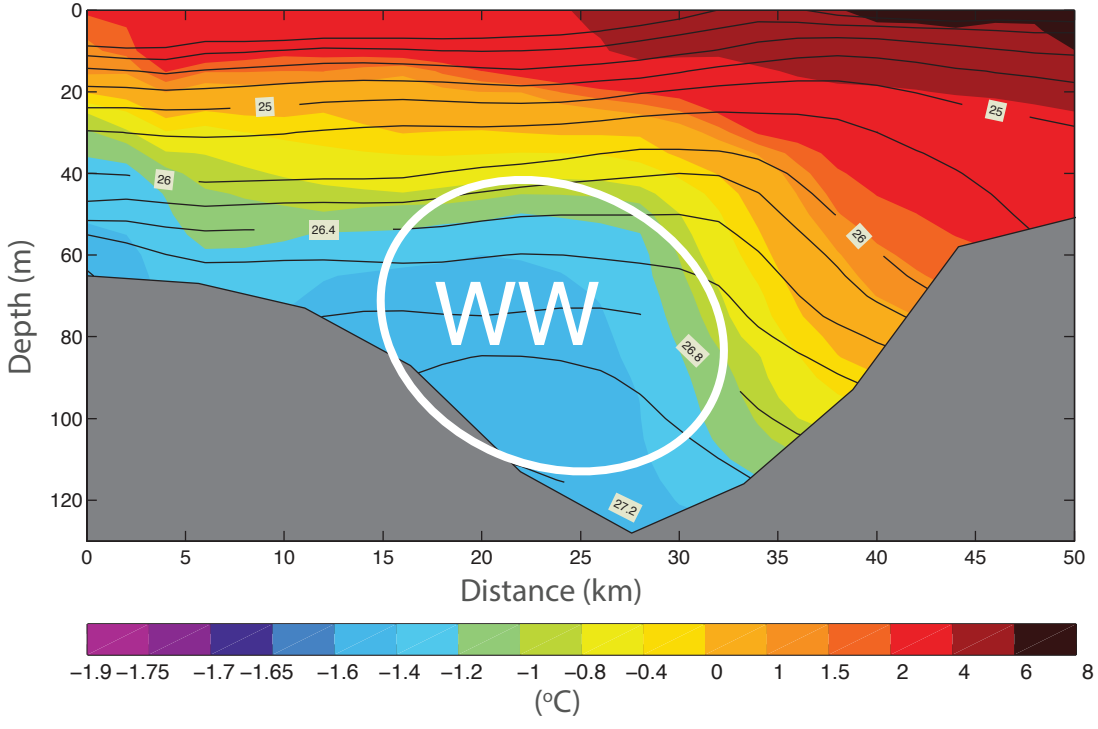


Salinity (color) overlain by potential density (contours)

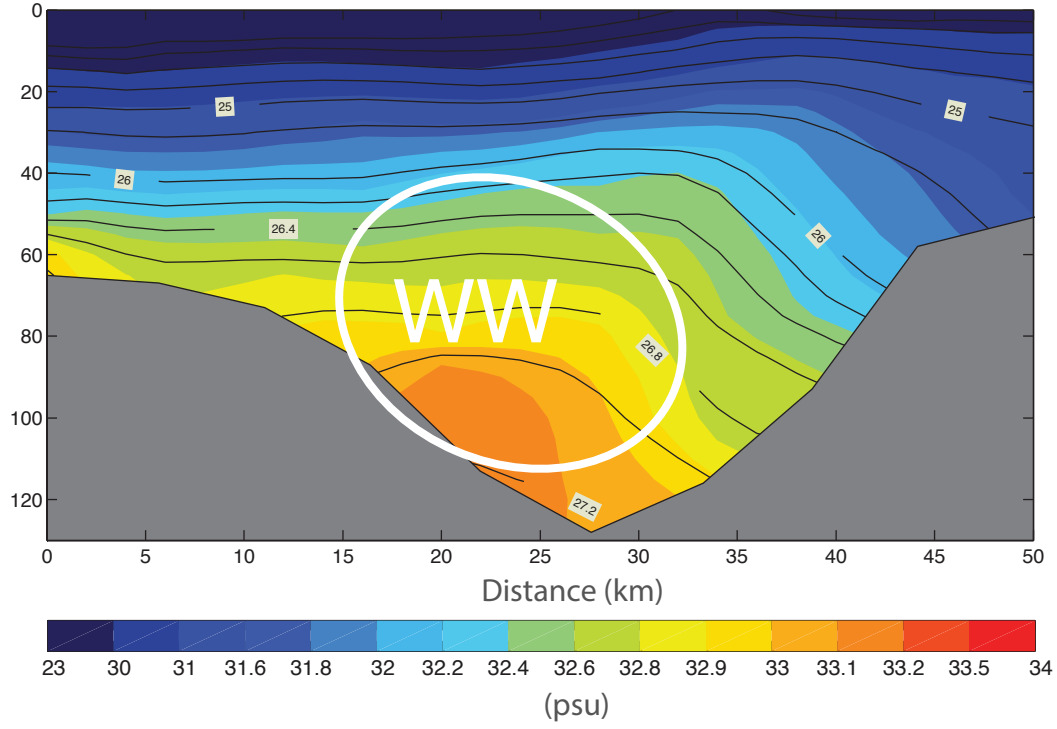


Mean Temperature and Salinity Fields for Barrow Canyon

Potential temperature (color) overlain by potential density (contours)

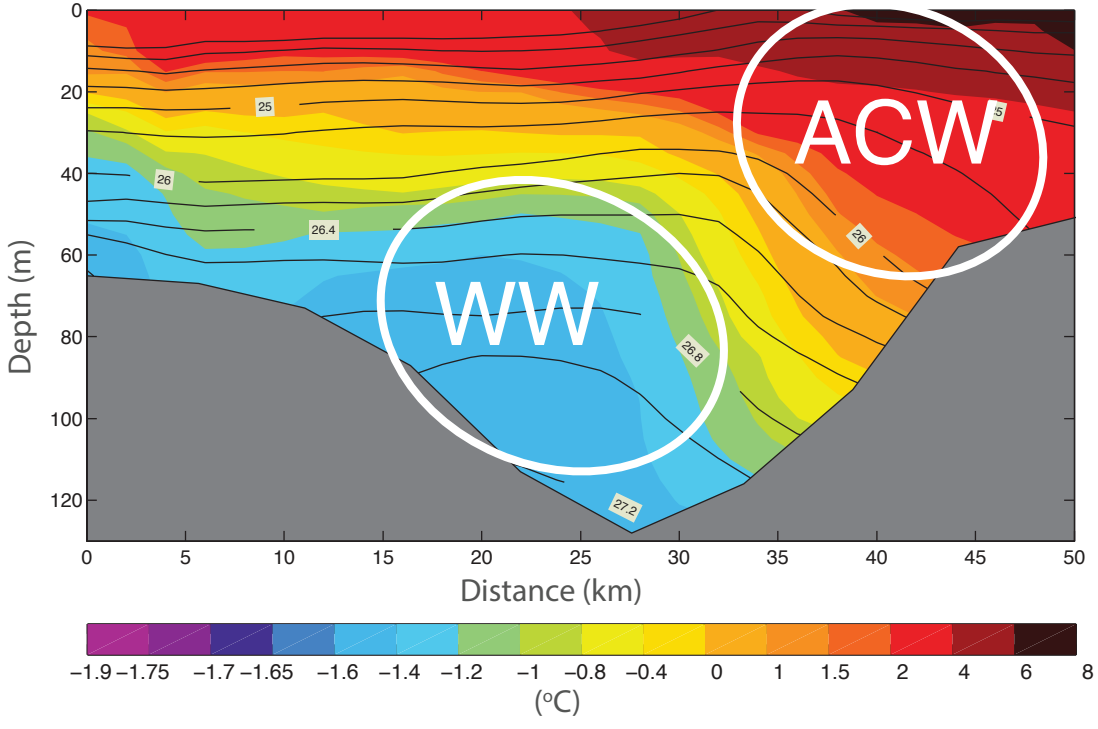


Salinity (color) overlain by potential density (contours)

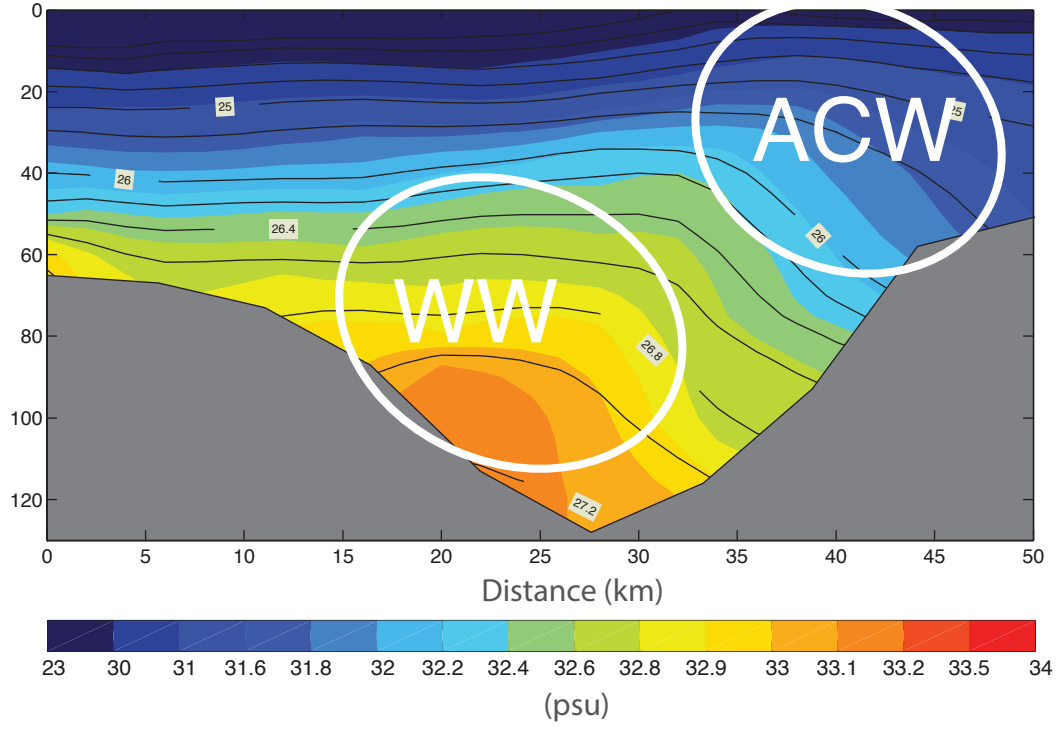


Mean Temperature and Salinity Fields for Barrow Canyon

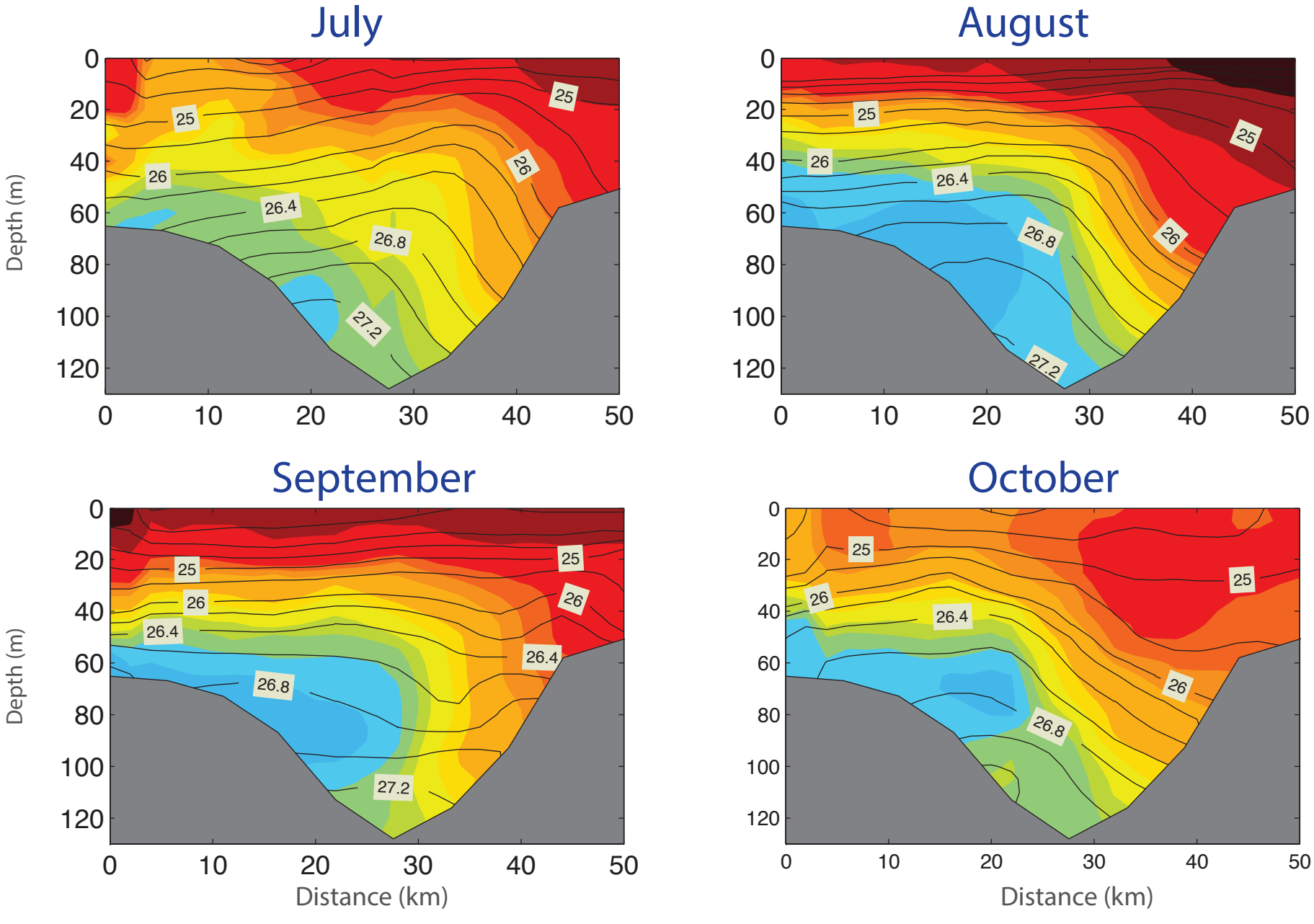
Potential temperature (color) overlain by potential density (contours)



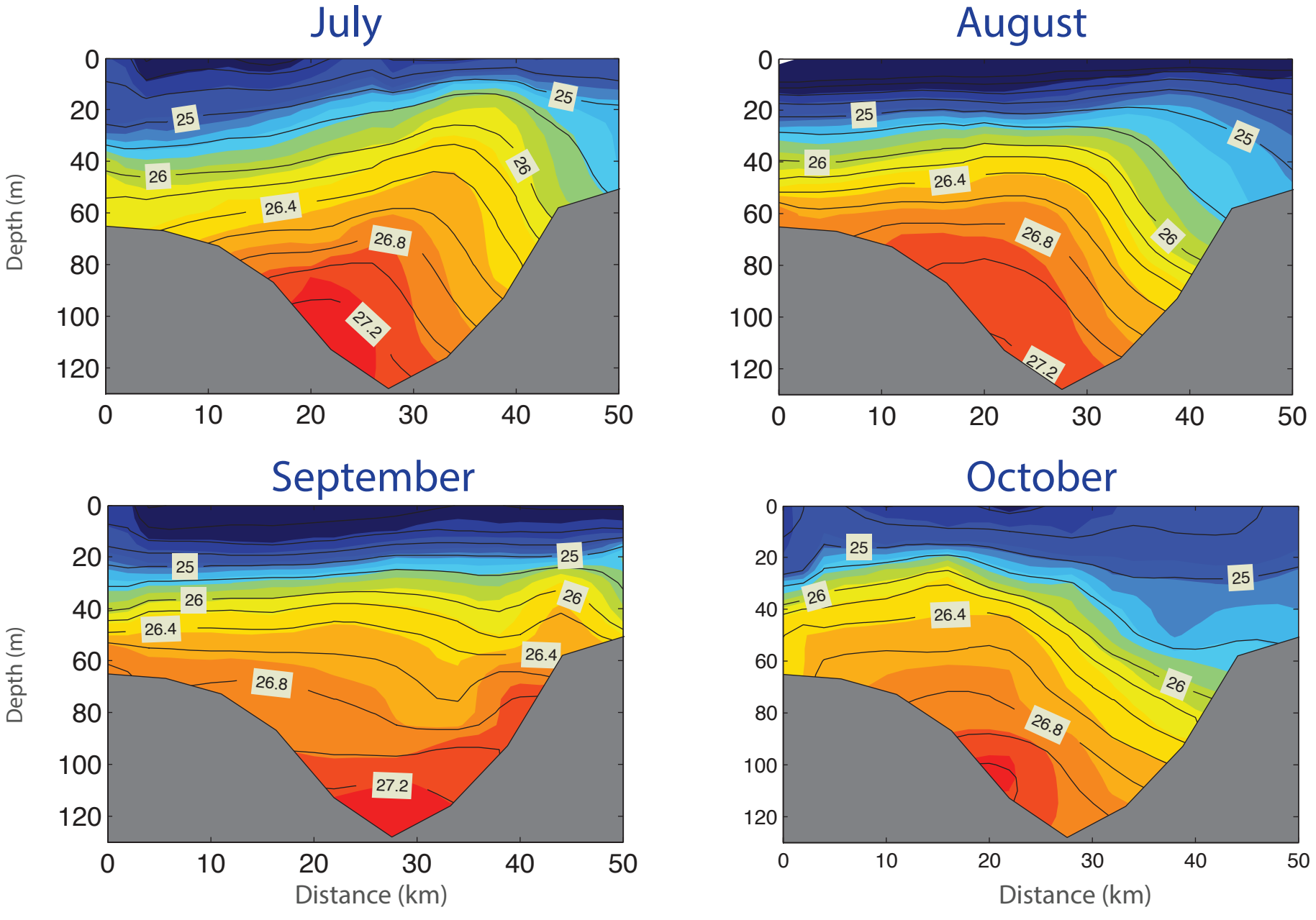
Salinity (color) overlain by potential density (contours)



Seasonal Composites of Potential temperature overlain by potential density



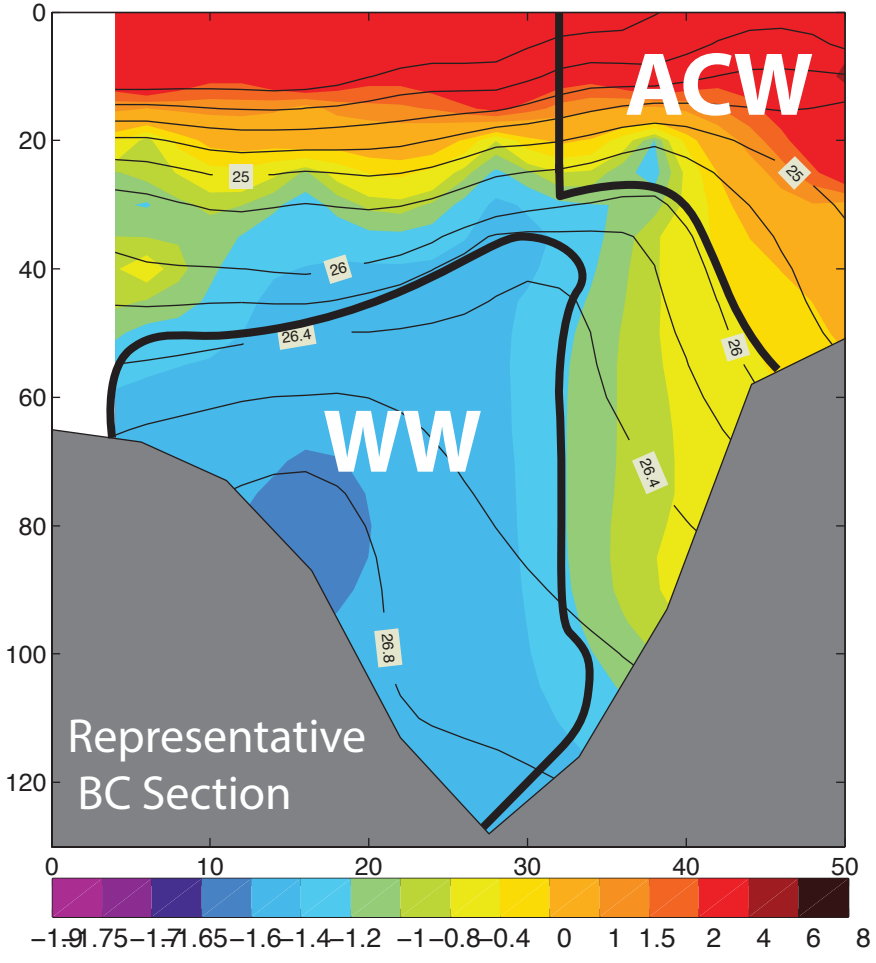
Seasonal Composites of Salinity overlain by potential density



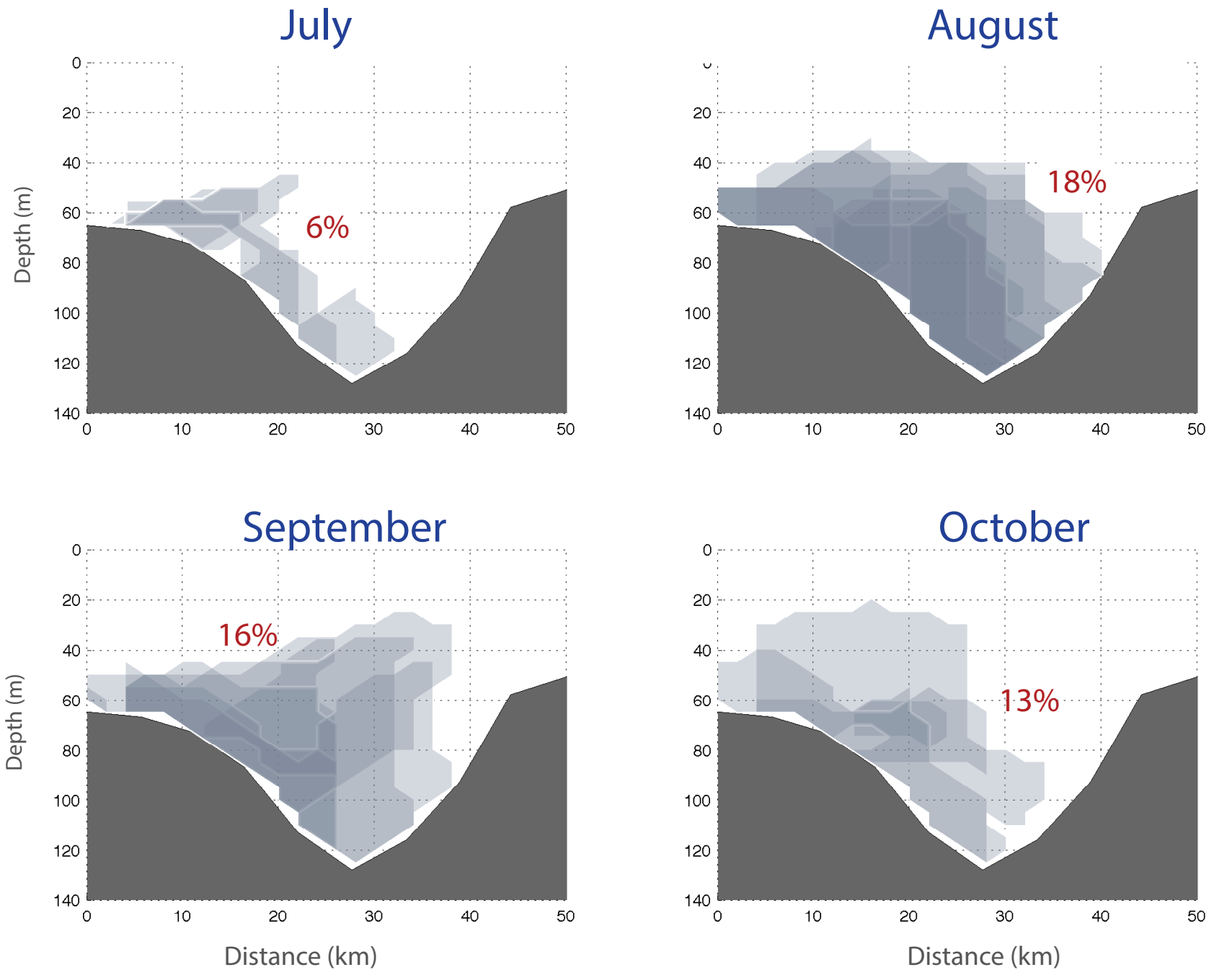
Water Mass Definitions

Winter Water was defined as water **denser than 26.2 kg/m^3 and colder than -1.2C**

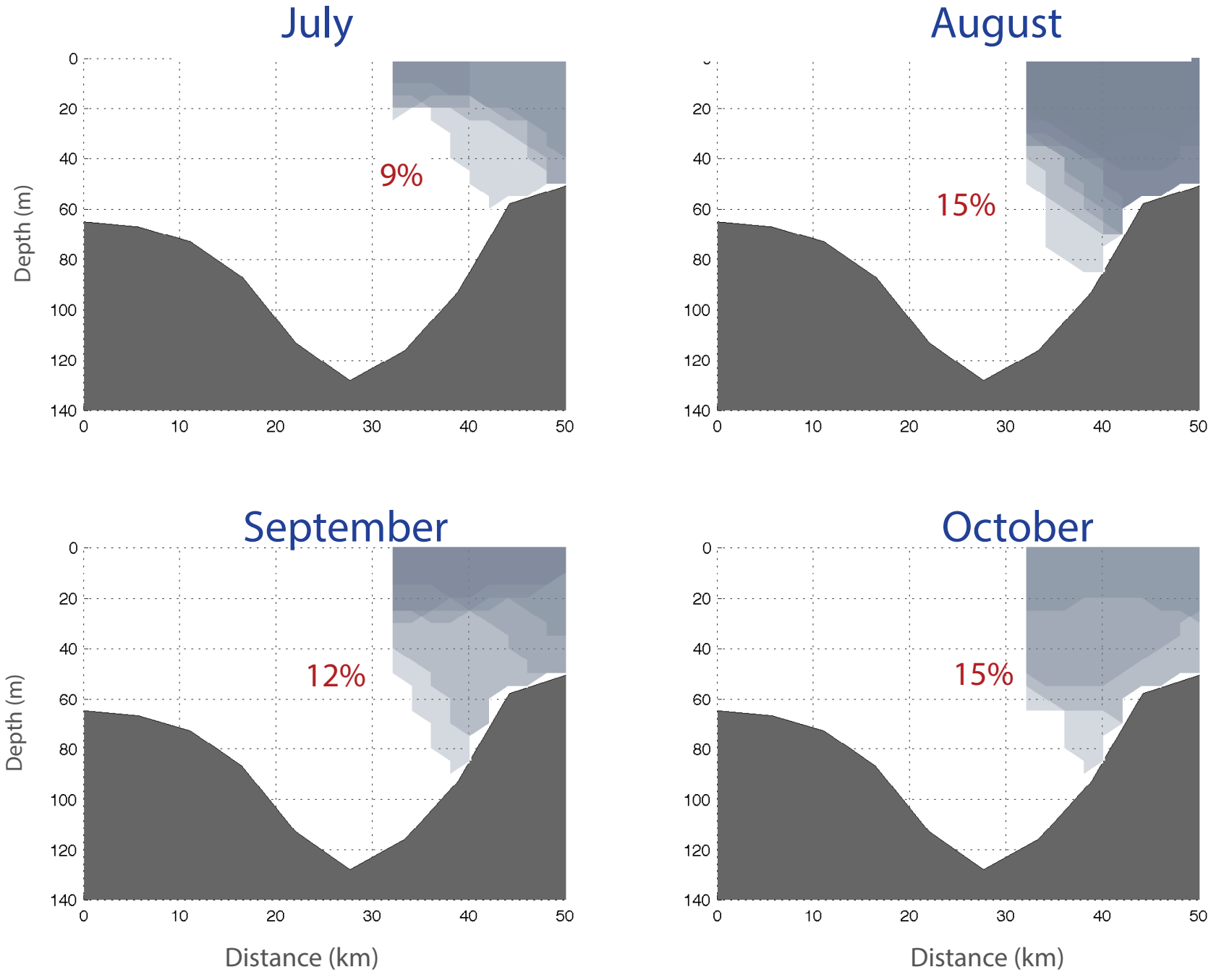
Alaskan Coastal Water was defined as water **lighter than 25.8 kg/m^3 and within 30km of the eastern flank of BC.**

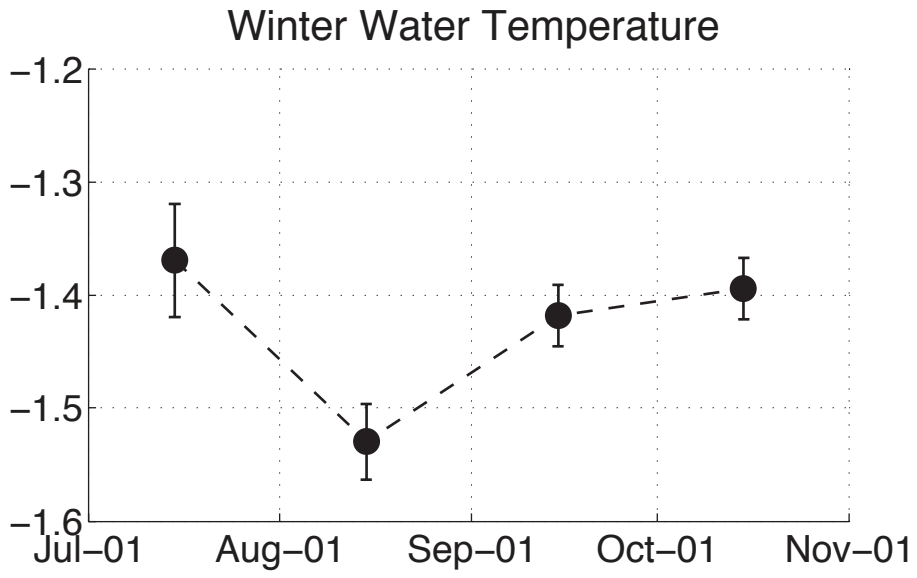


Seasonal Variation of the Position of WW

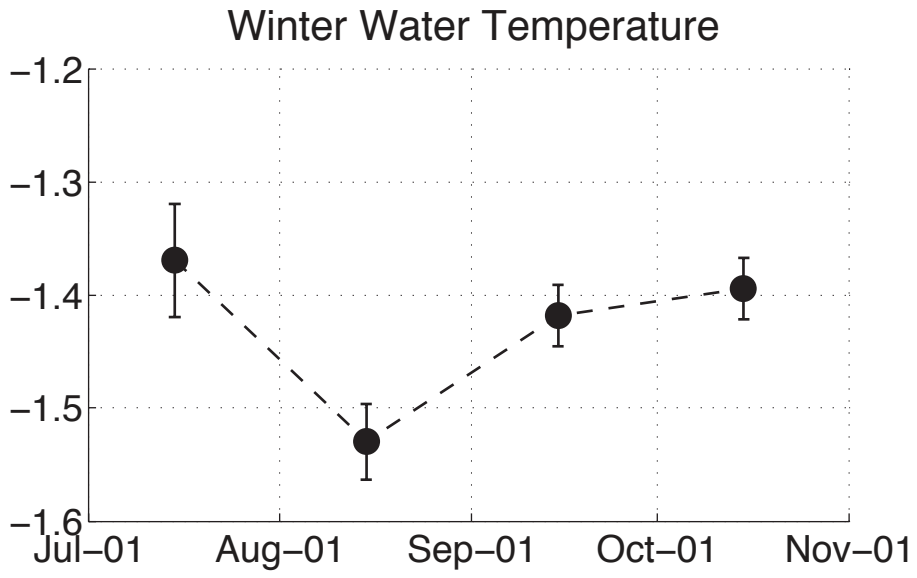


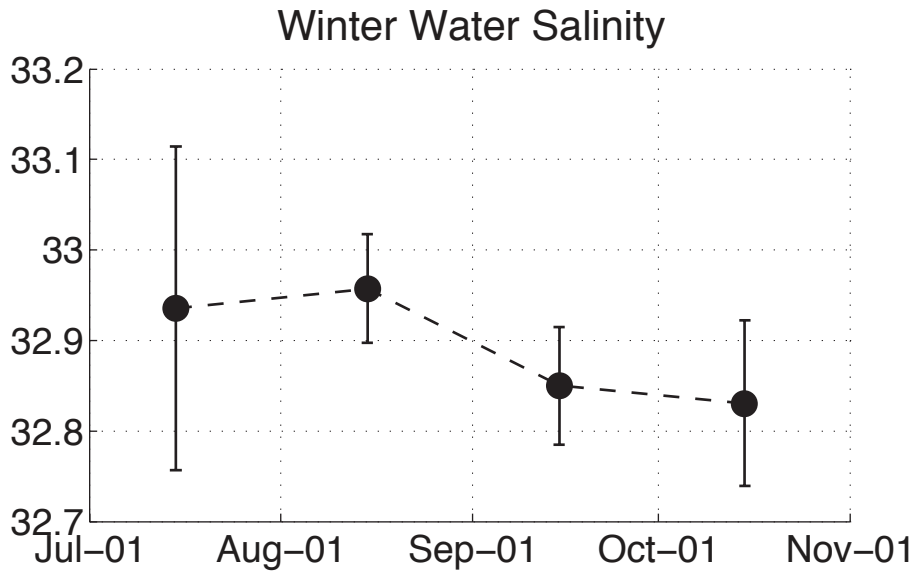
Seasonal Variation of the Position of ACW



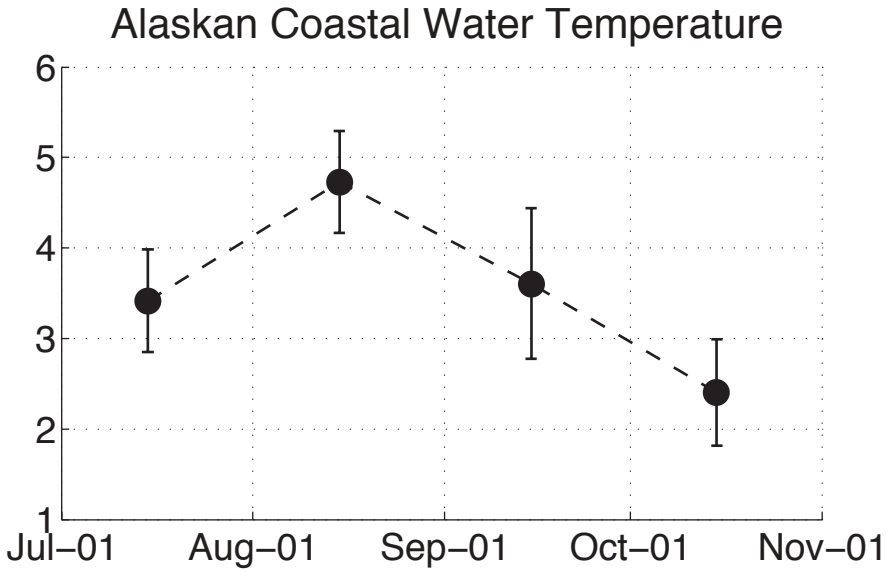


Winter Water is **coldest** in August

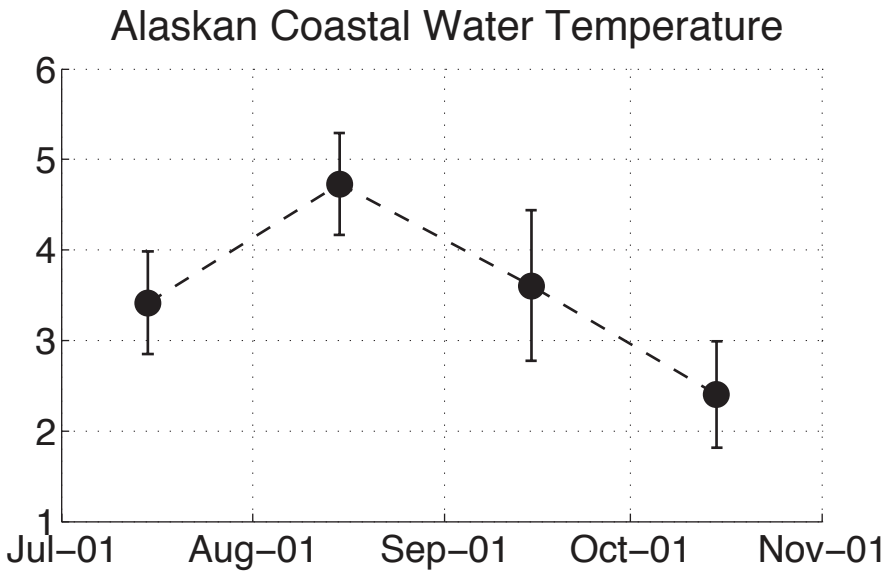


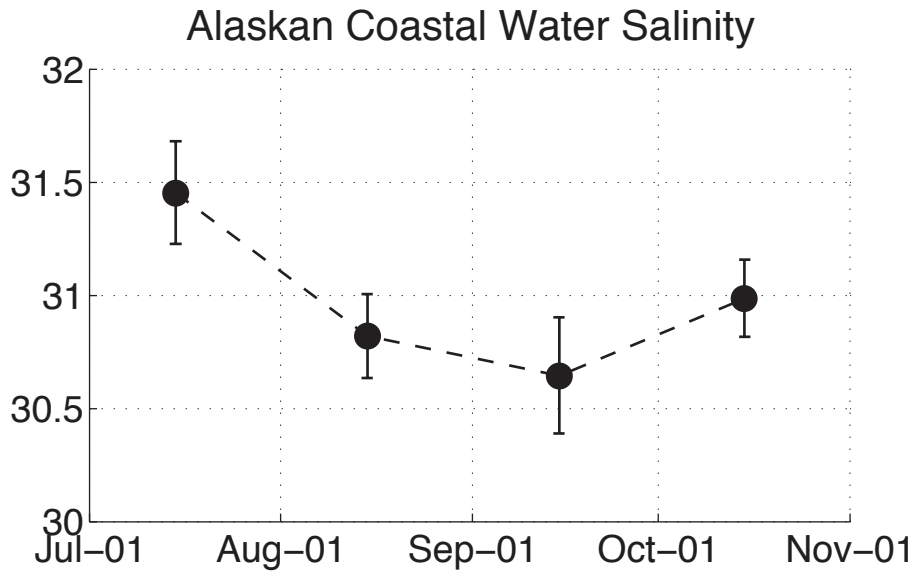


Winter Water is **coldest** in August and **saltiest** in early summer.



Alaskan Coastal Water is **warmest** in August





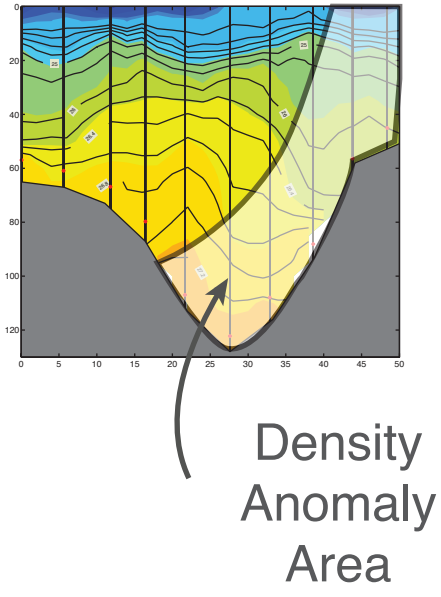
Alaskan Coastal Water is **warmest** in August and **Freshest** in September

WHAT IS DBO?
THE PROGRAM AND SCOPE OF THE DATA

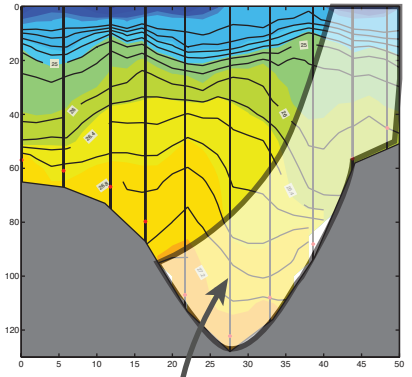
MEAN FIELDS & SEASONALITY
ASSESSING SEASONAL VARIATION IN WATER MASSES AND WIND FORCING

MESO-SCALE VARIABILITY
UPWELLING EVENTS

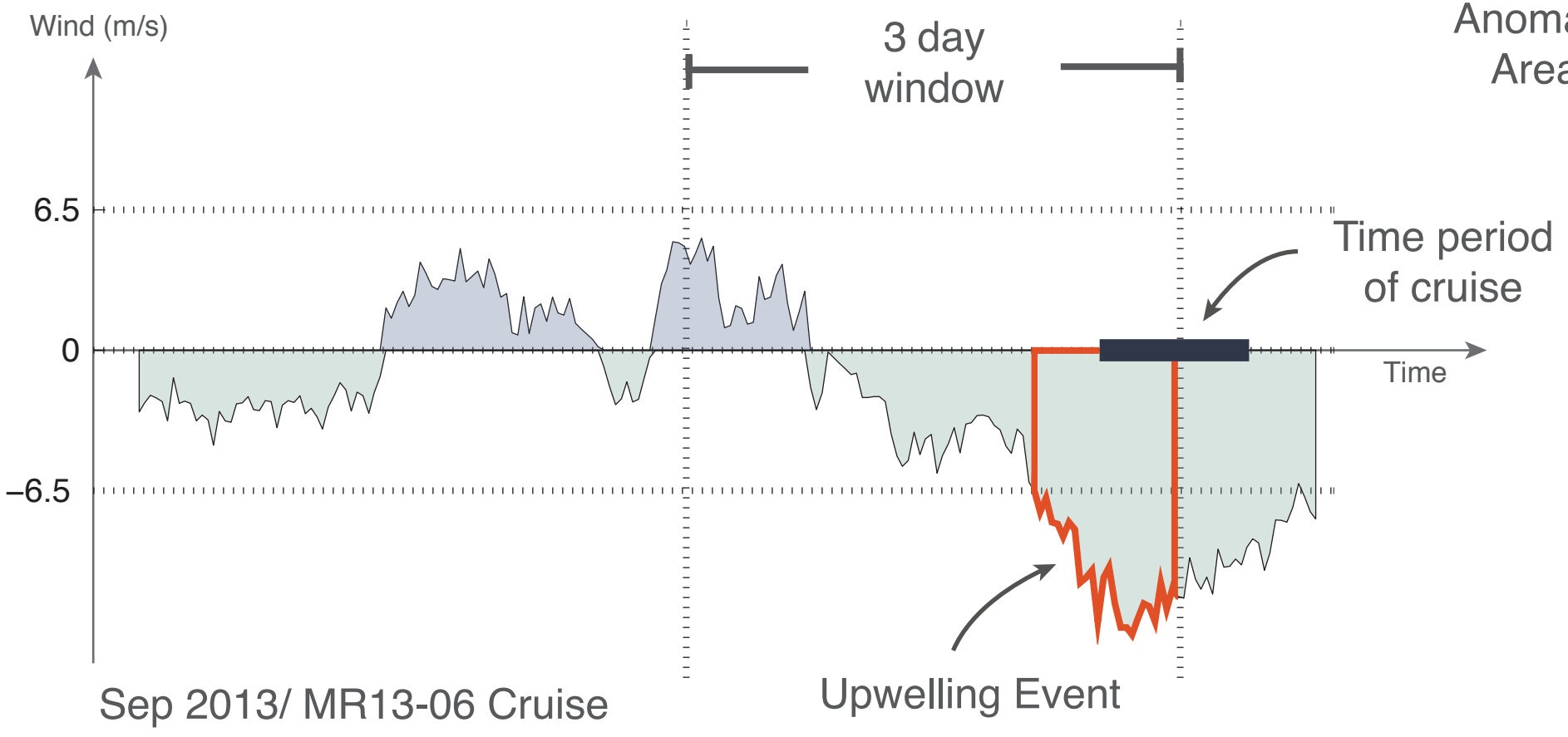
The highest correlation between the along canyon component of the wind and the density anomaly was for **a wind speed exceeding 6.5m/s**, within a **window of 3 days**



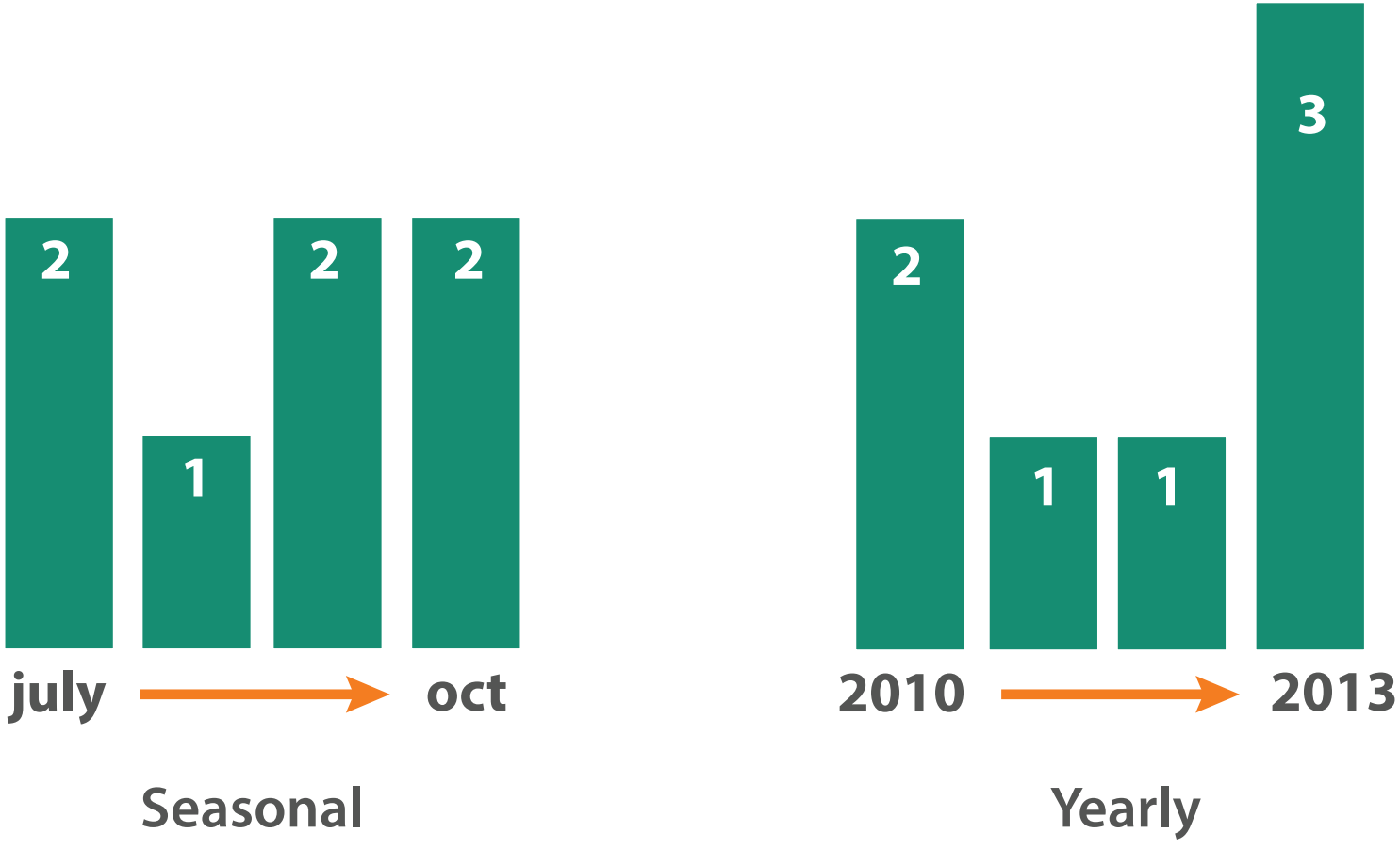
The highest correlation between the along canyon component of the wind and the density anomaly was for **a wind speed exceeding 6.5m/s**, within a **window of 3 days**



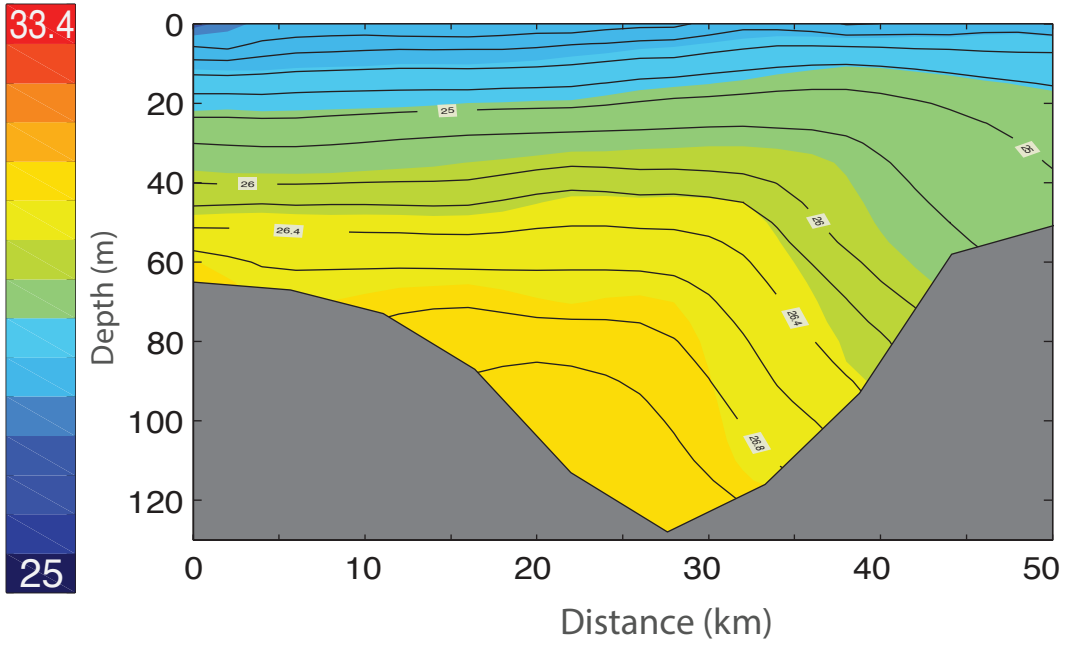
Density Anomaly Area



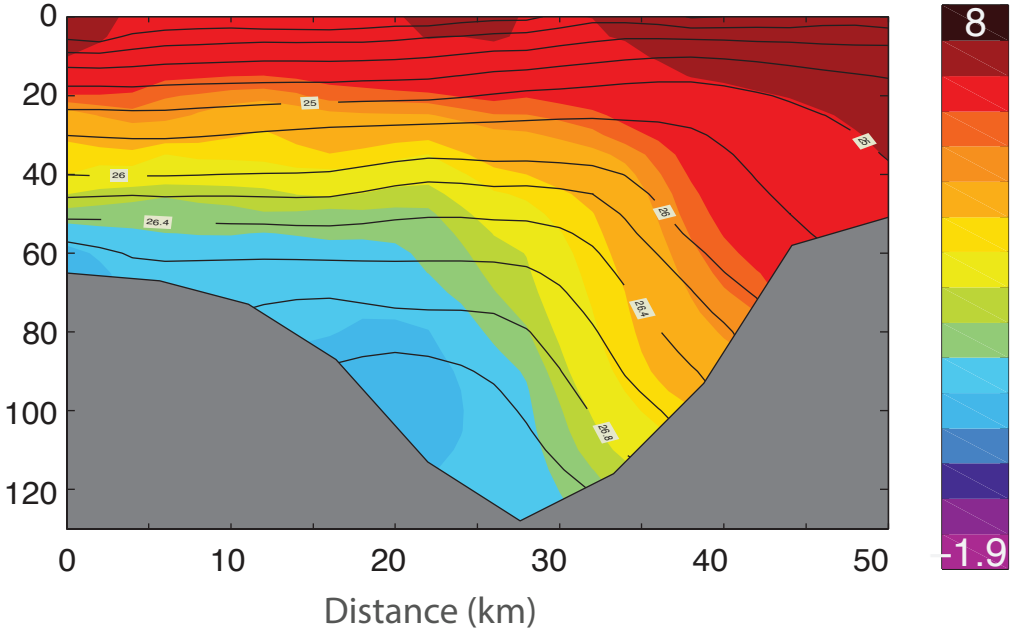
Distribution of Upwelling Events



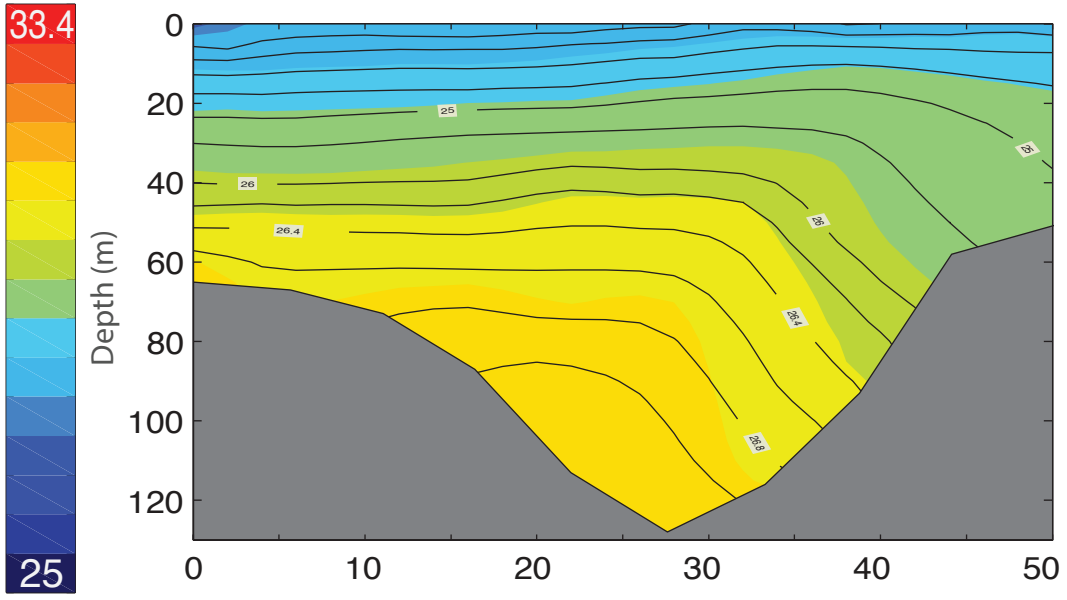
Salinity - Unforced Sections



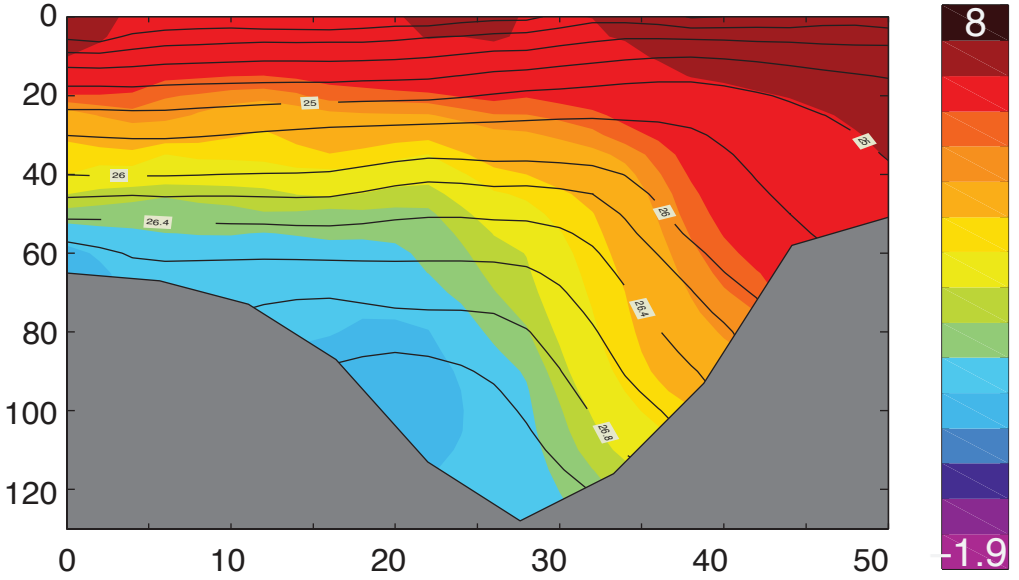
Potential temperature - Unforced Sections



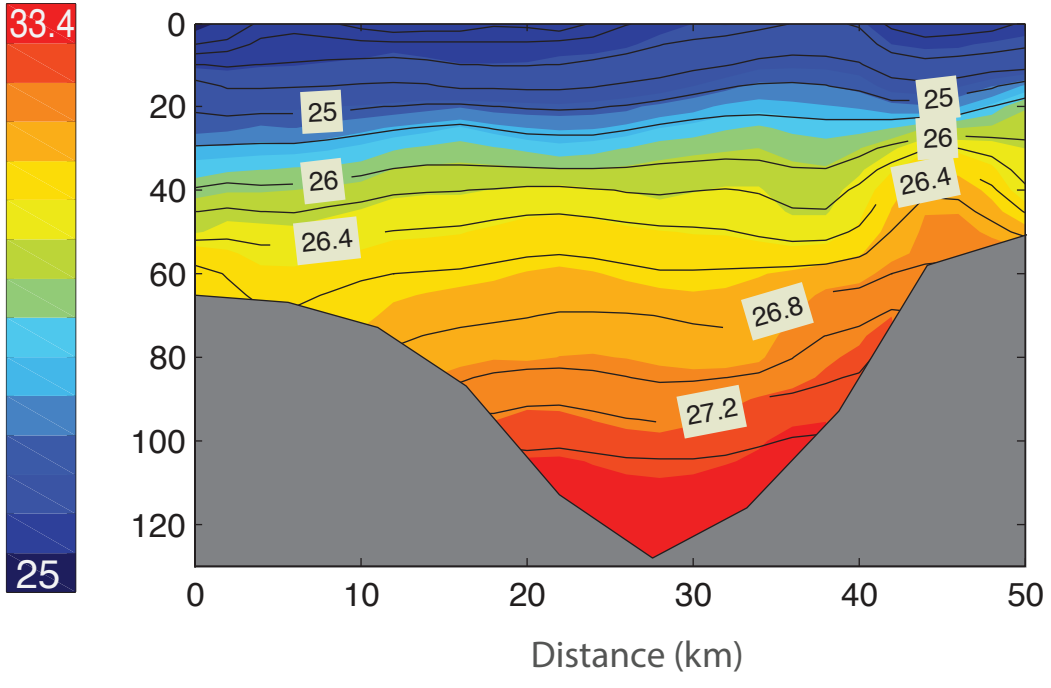
Salinity - Unforced Sections



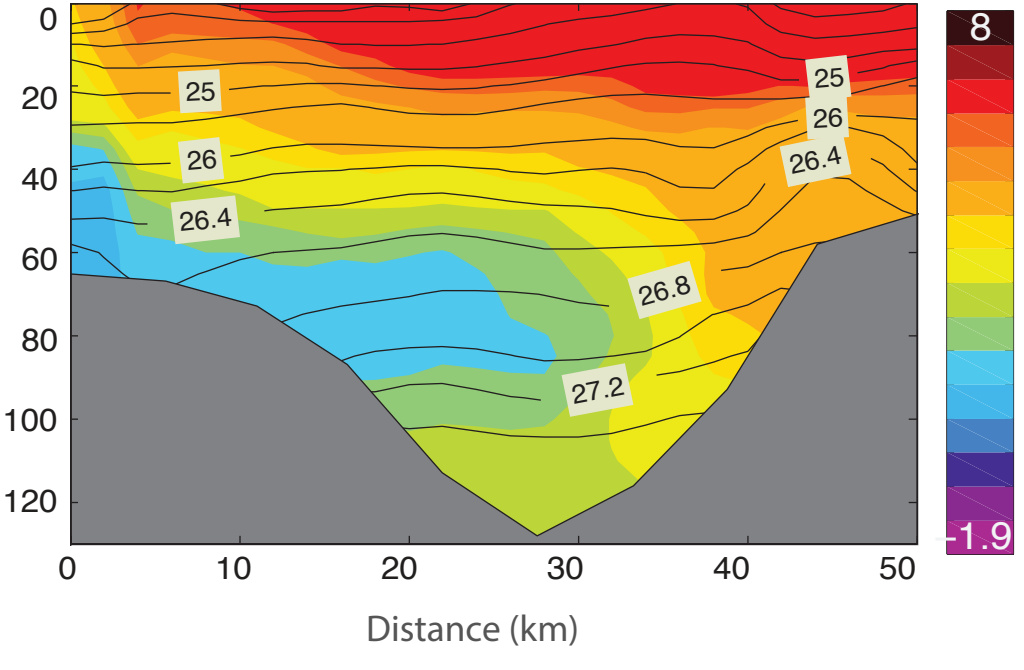
Potential temperature - Unforced Sections



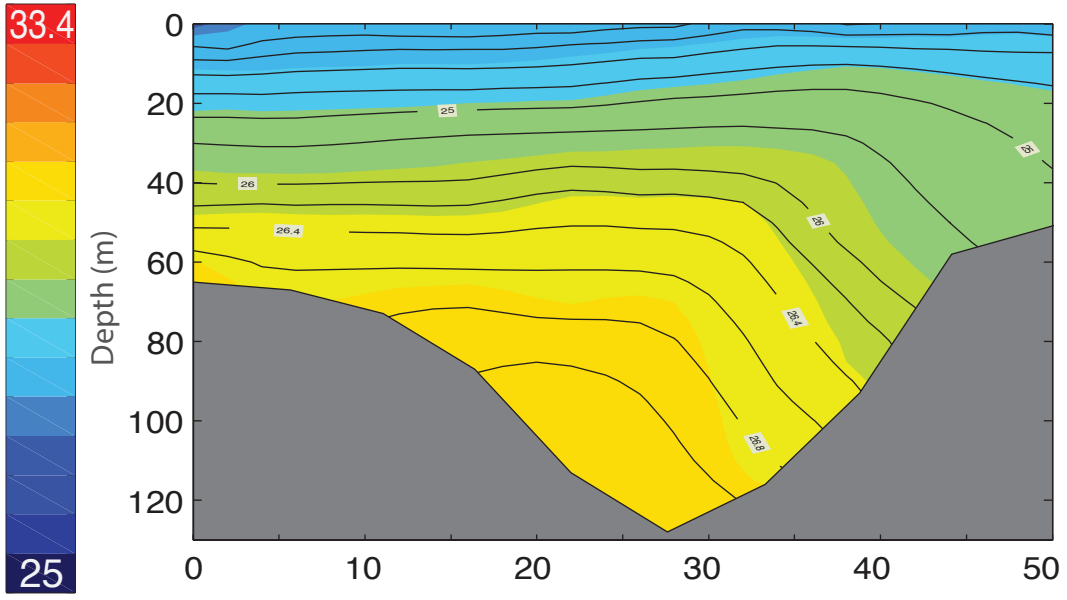
Salinity - Upwelling Sections



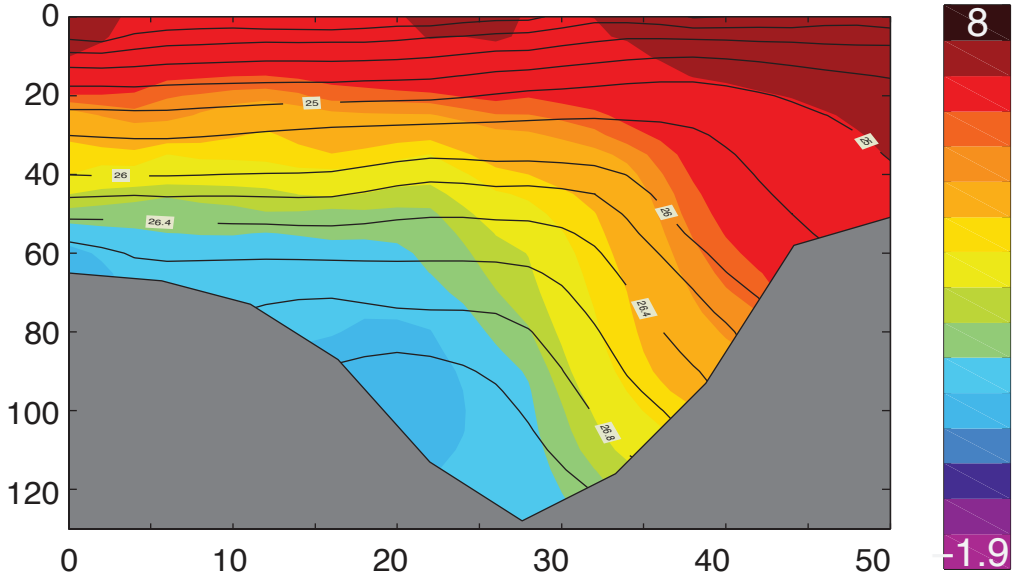
Potential temperature - Upwelling Sections



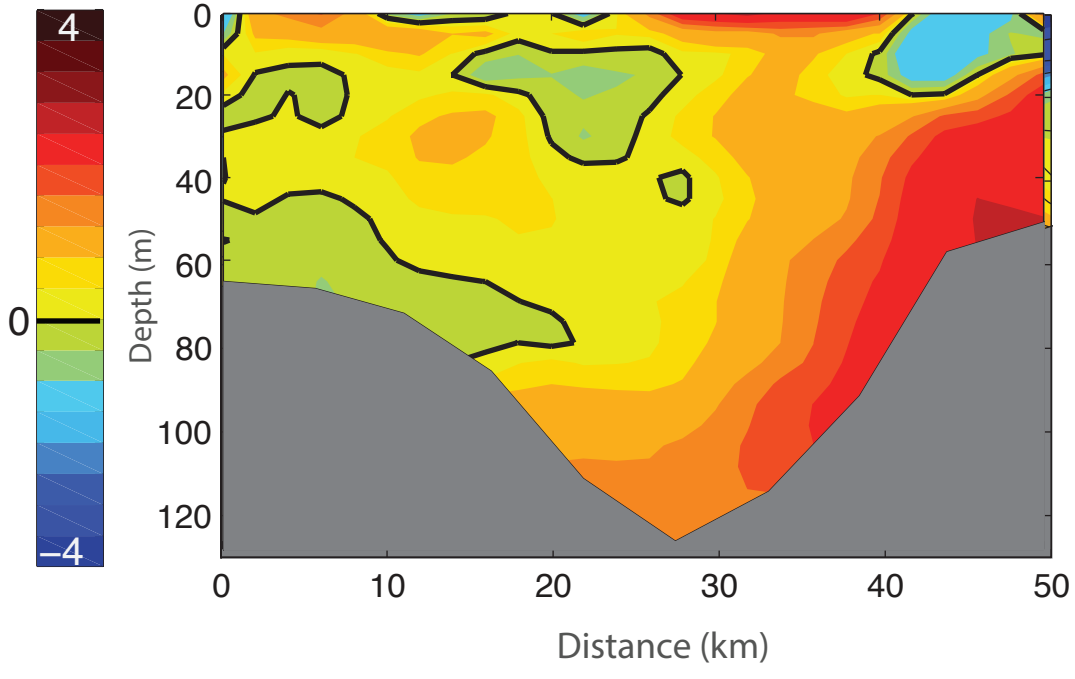
Salinity - Unforced Sections



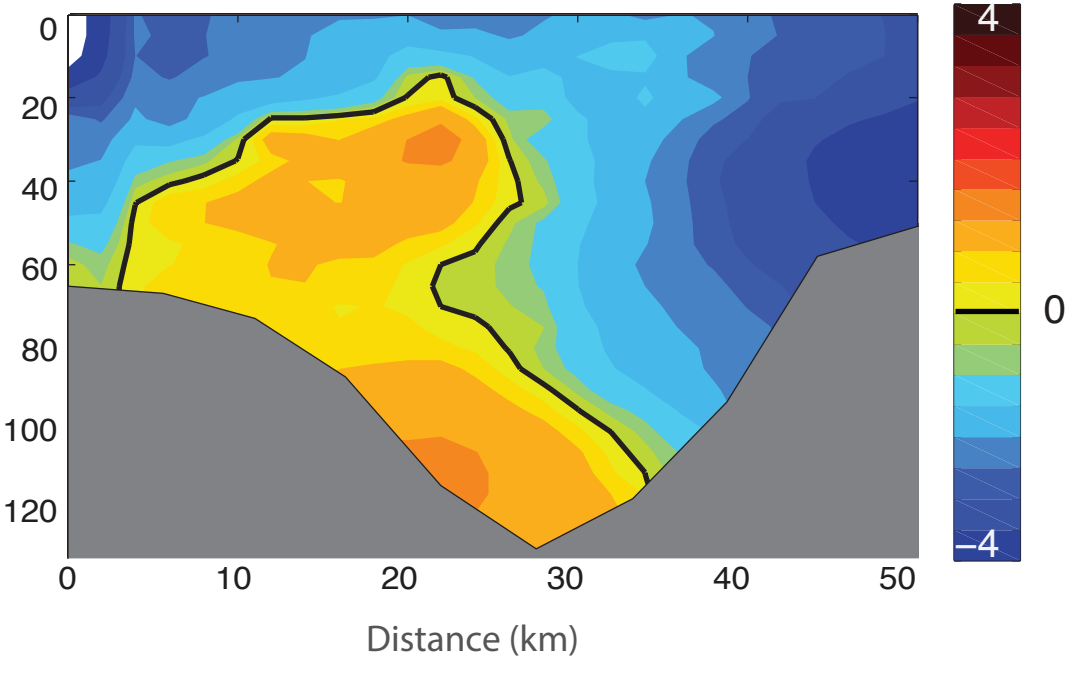
Potential temperature - Unforced Sections

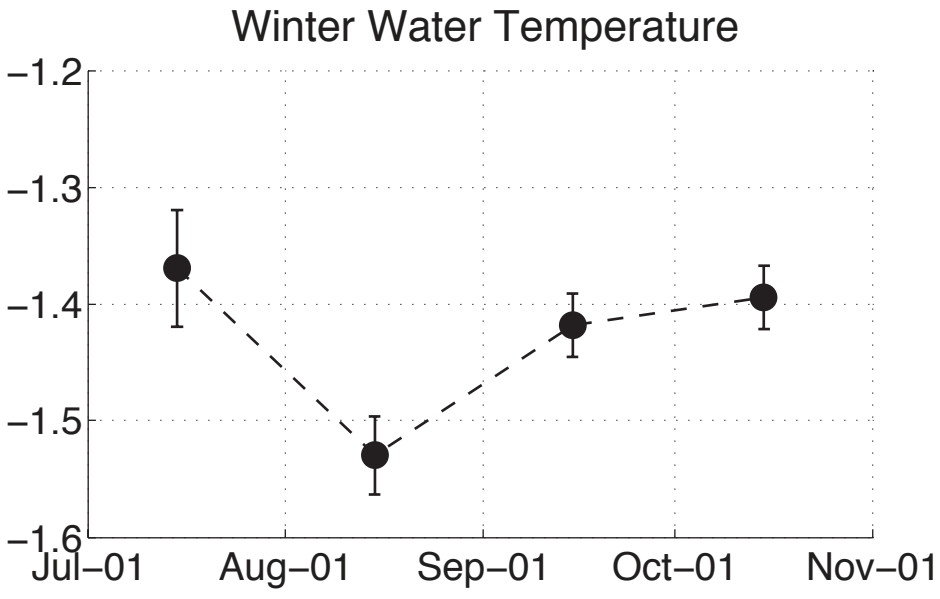


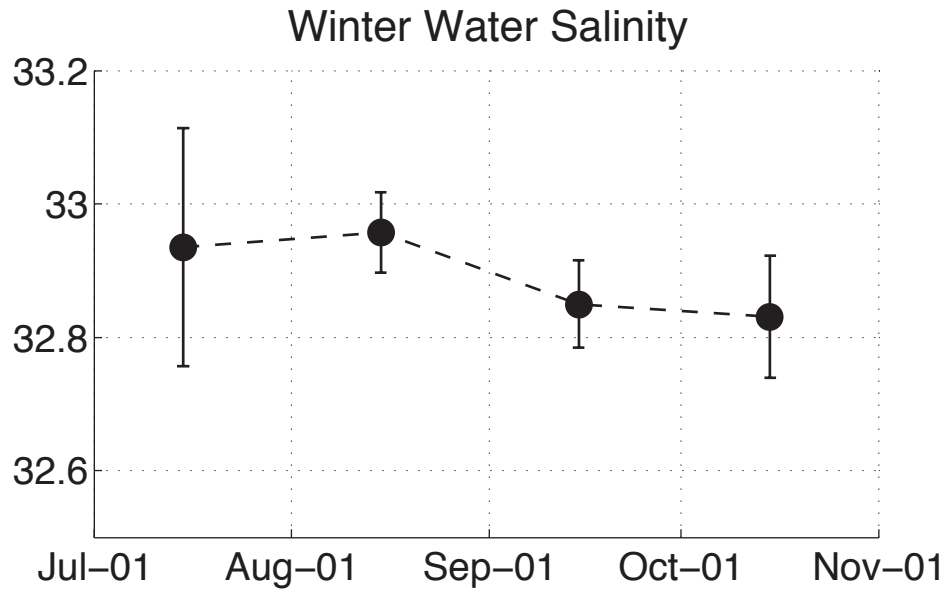
Salinity Anomaly - Upwelling Sections

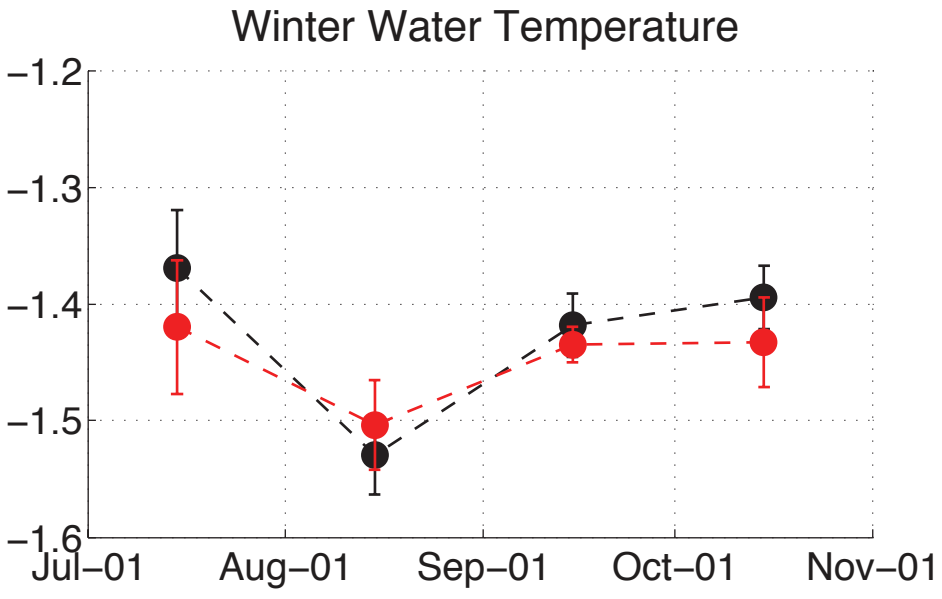


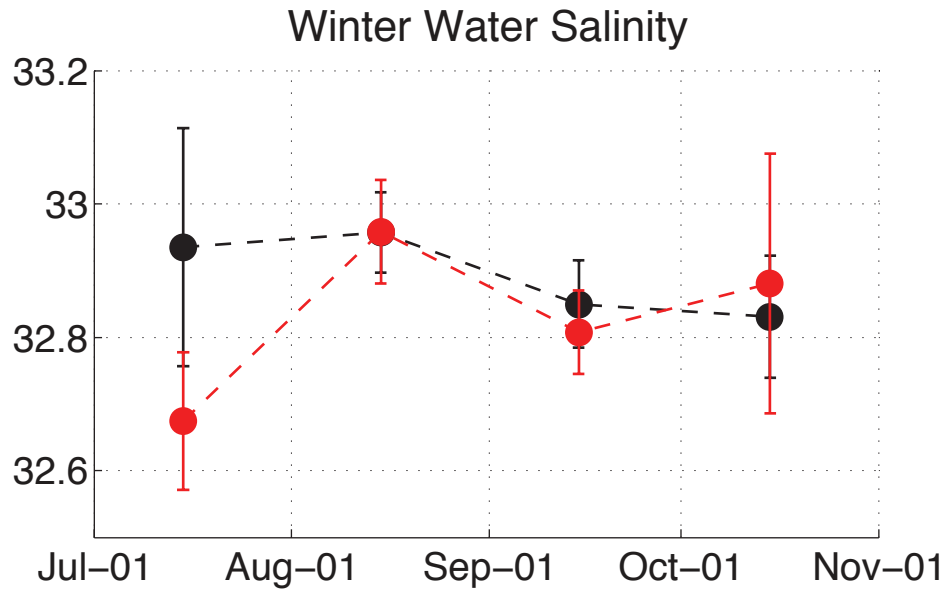
Temperature Anomaly - Uwpwellling Sections

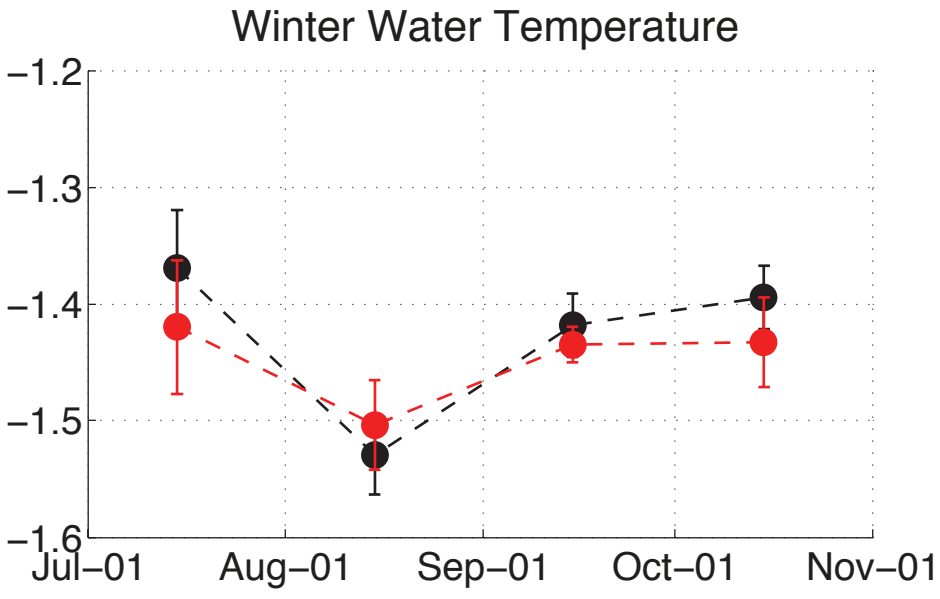


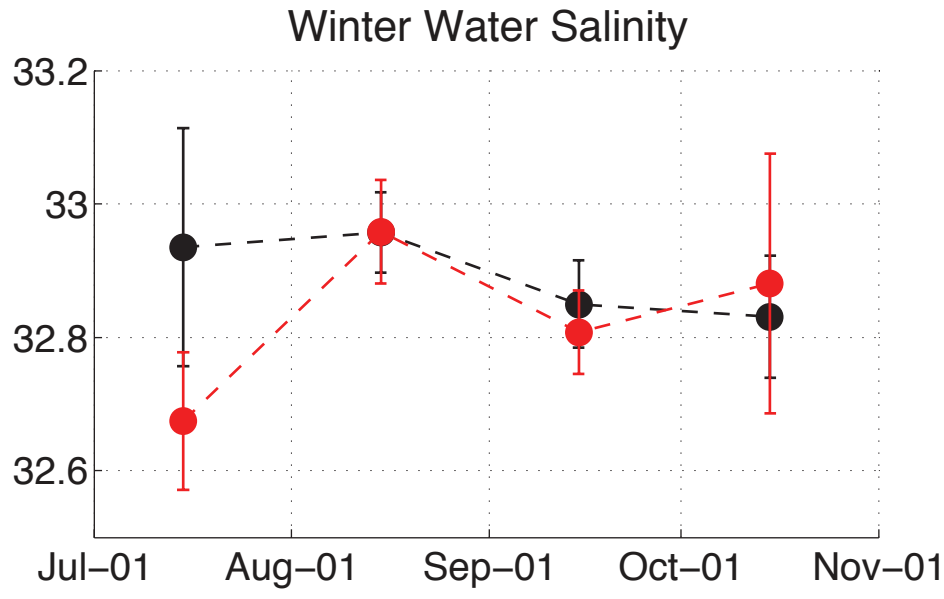

Winter Water Temperature
−1.2
−1.3
−1.4
−1.5
−1.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

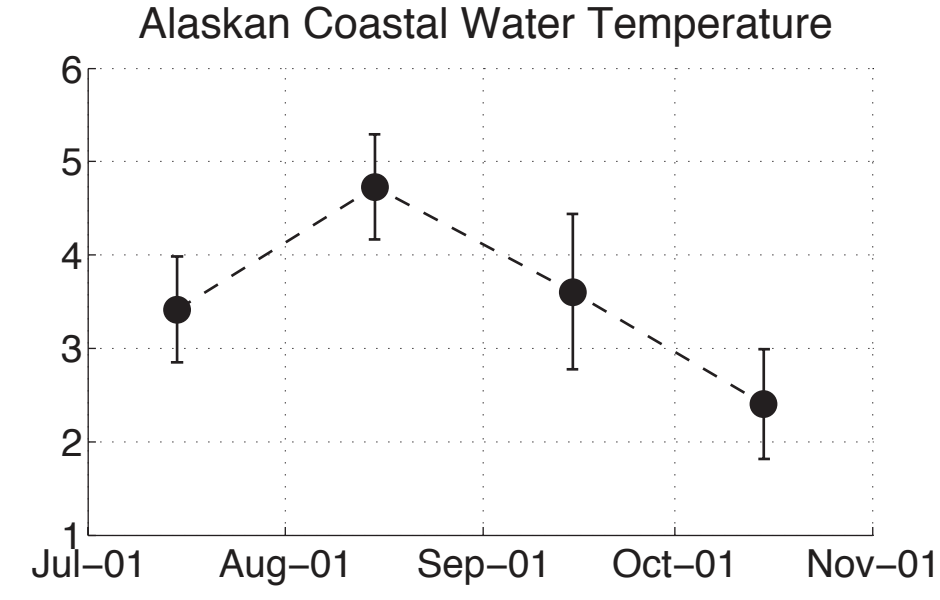

Winter Water Salinity
33.2
33
32.8
32.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

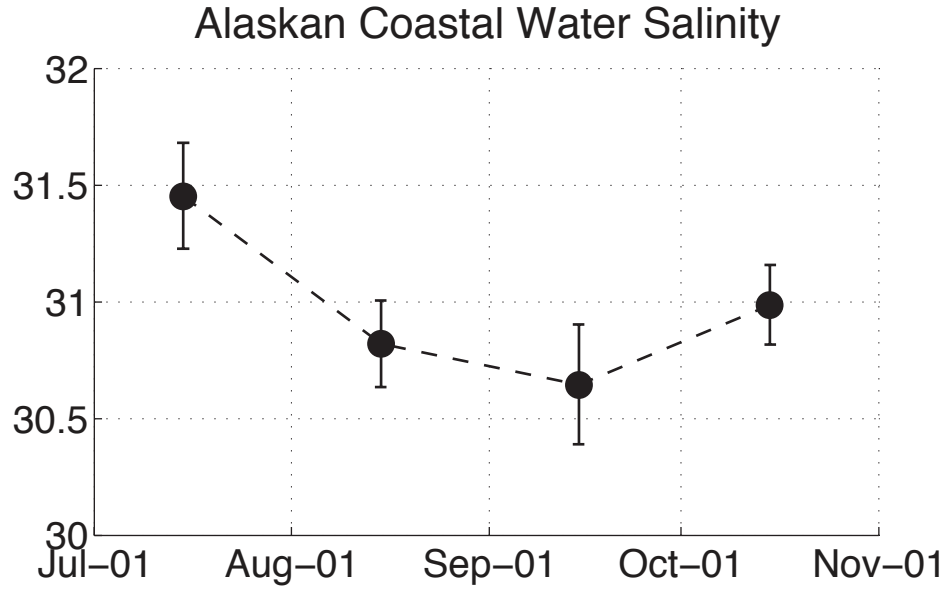

Winter Water Temperature
−1.2
−1.3
−1.4
−1.5
−1.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

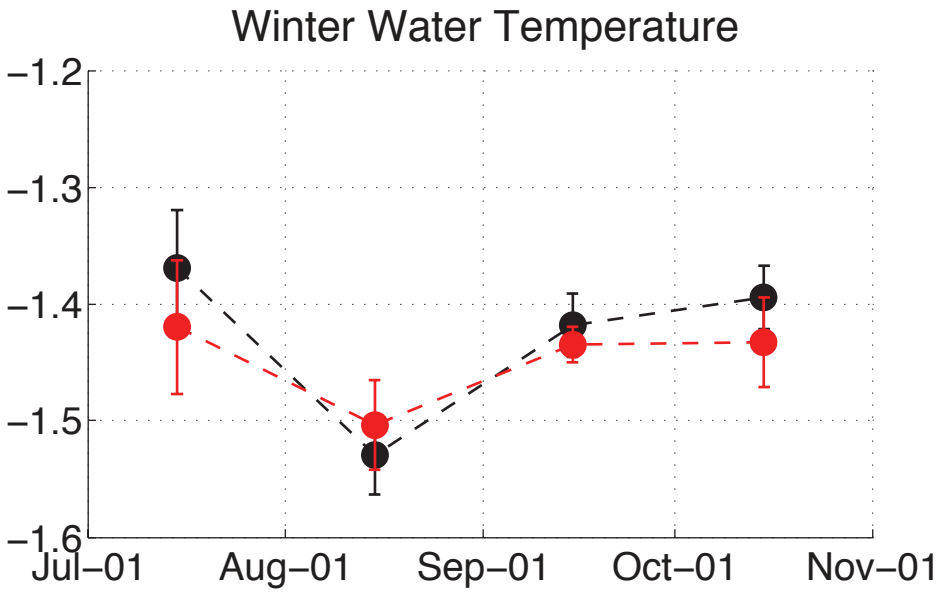

Winter Water Salinity
33.2
33
32.8
32.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

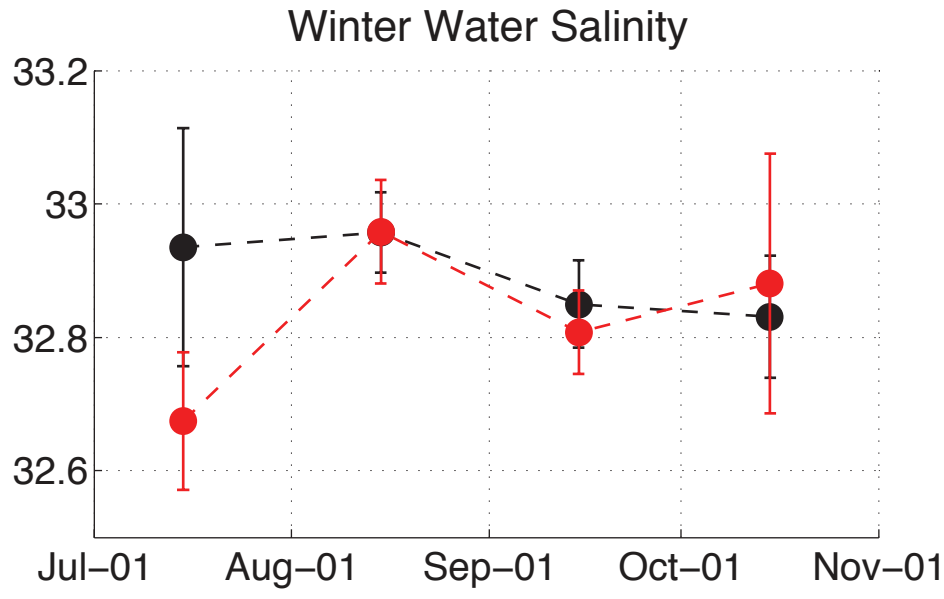

Winter Water Temperature
−1.2
−1.3
−1.4
−1.5
−1.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

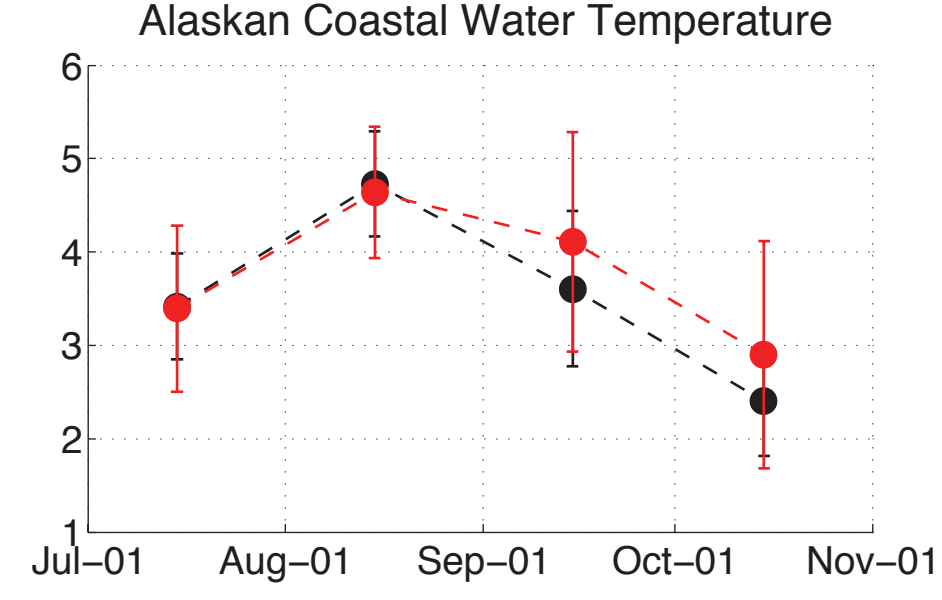

Winter Water Salinity
33.2
33
32.8
32.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

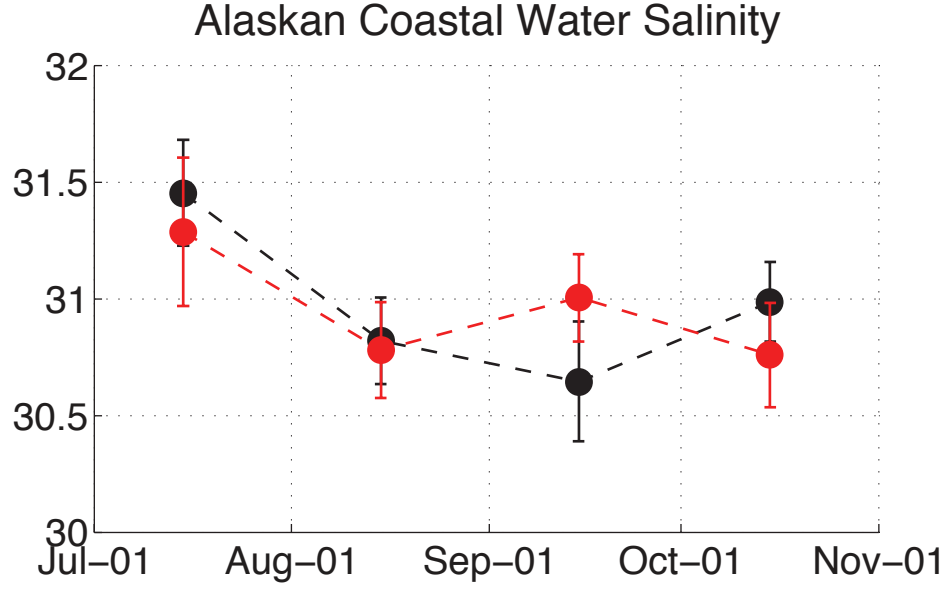

Alaskan Coastal Water Temperature
6
5
4
3
2
1
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01


Alaskan Coastal Water Salinity
32
31.5
31
30.5
30
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01


Winter Water Temperature
−1.2
−1.3
−1.4
−1.5
−1.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01


Winter Water Salinity
33.2
33
32.8
32.6
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01


Alaskan Coastal Water Temperature
6
5
4
3
2
1
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01


Alaskan Coastal Water Salinity
32
31.5
31
30.5
30
Jul−01
Aug−01
Sep−01
Oct−01
Nov−01

Take home messages

IF YOU ONLY TAKE THREE THINGS FROM THIS TALK...

1. The DBO pilot program has been a success!

2. In the absence of upwelling:

   WW is coldest and saltiest in August

   ACW is warmest and freshest in August

3. Upwelling occurs roughly 1/3 of the time (7/24 occupations) and significantly alters the hydrography on both sides of the canyon

What's next?

Continue adding **high resolution** occupations to the DBO database!

Ensuring that all nominal stations for a given line are occupied significantly improves the quality of the dataset and ensure much more robust results.