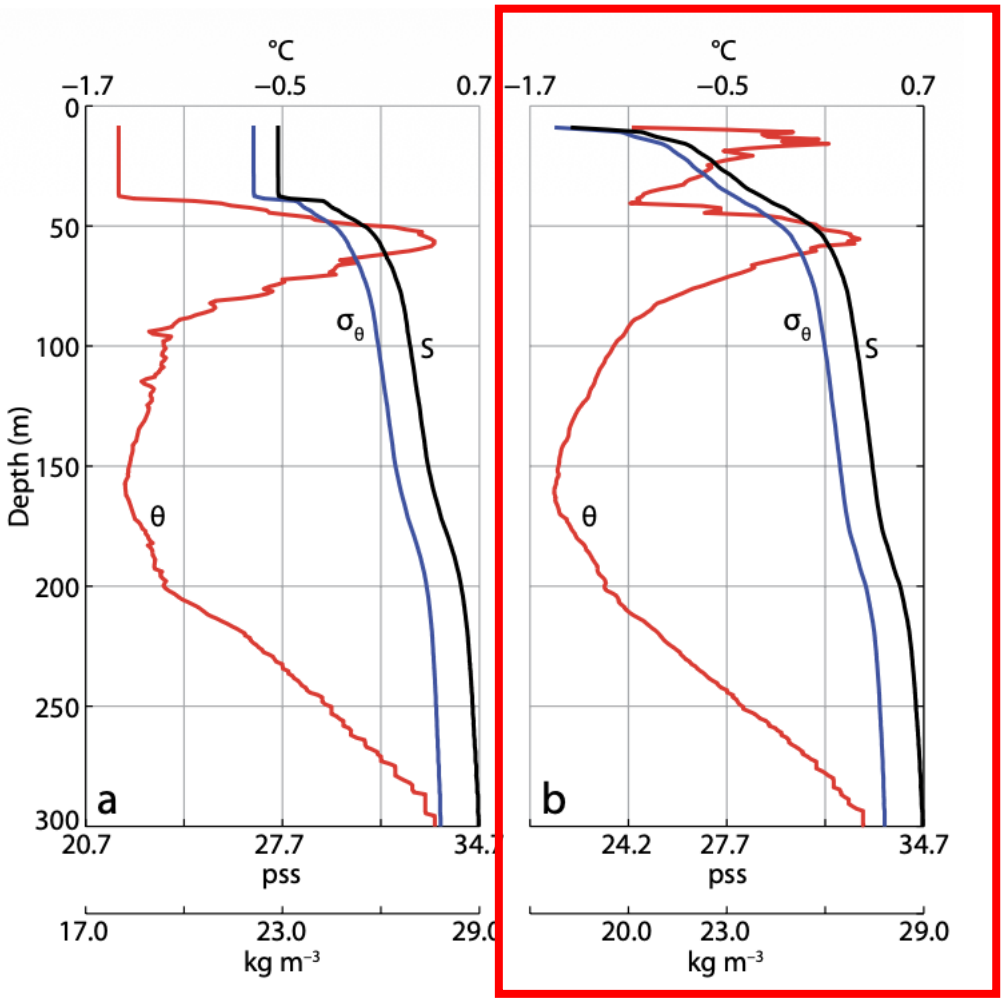
Float Observations in the Beaufort Sea – Preliminary Results

Frederick Bingham, Carlyn Schmidgall, Michael Steele and Steve Jayne



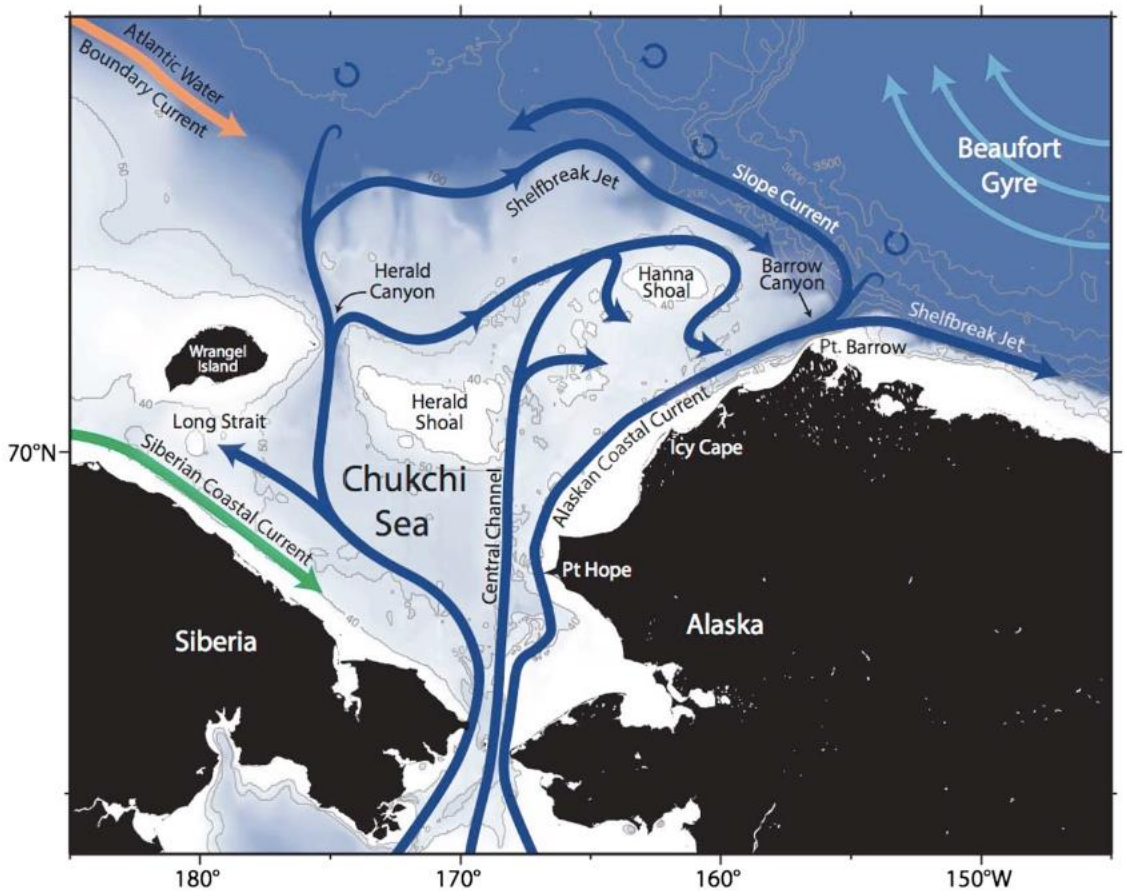
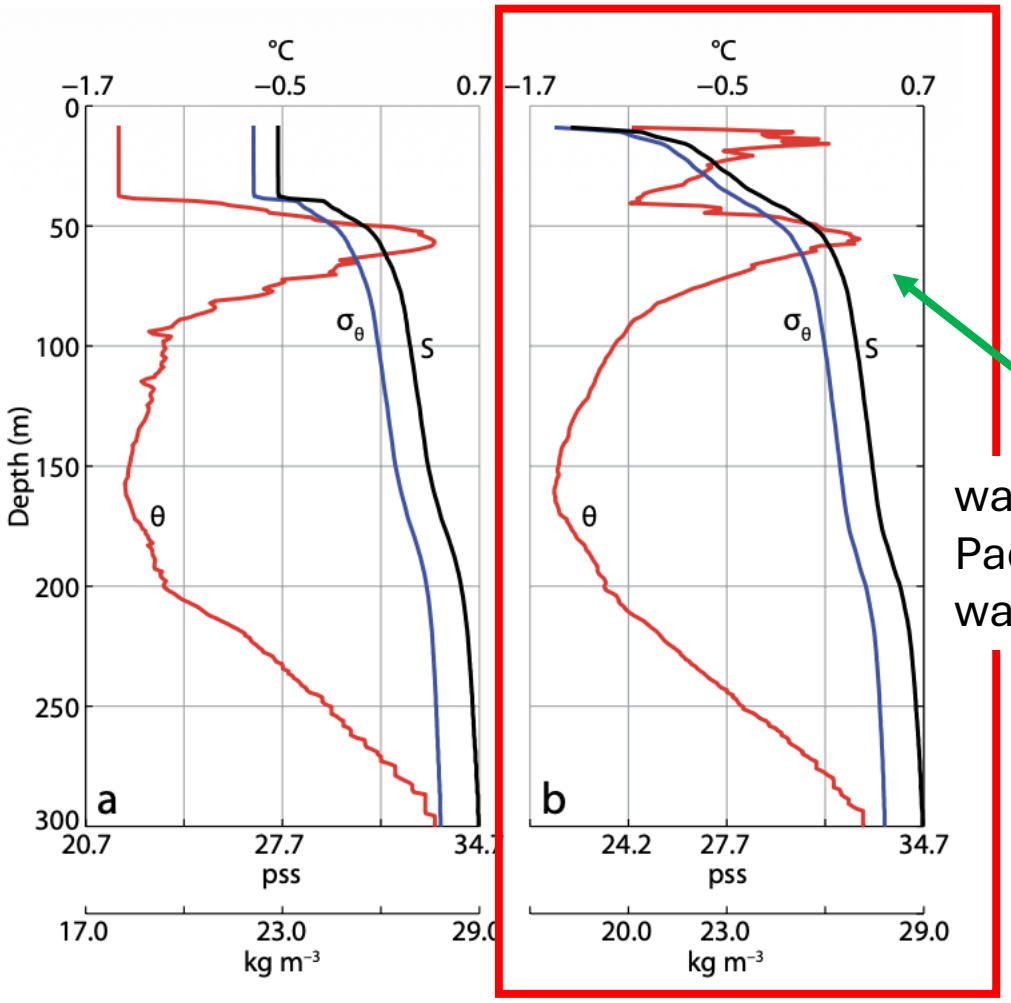


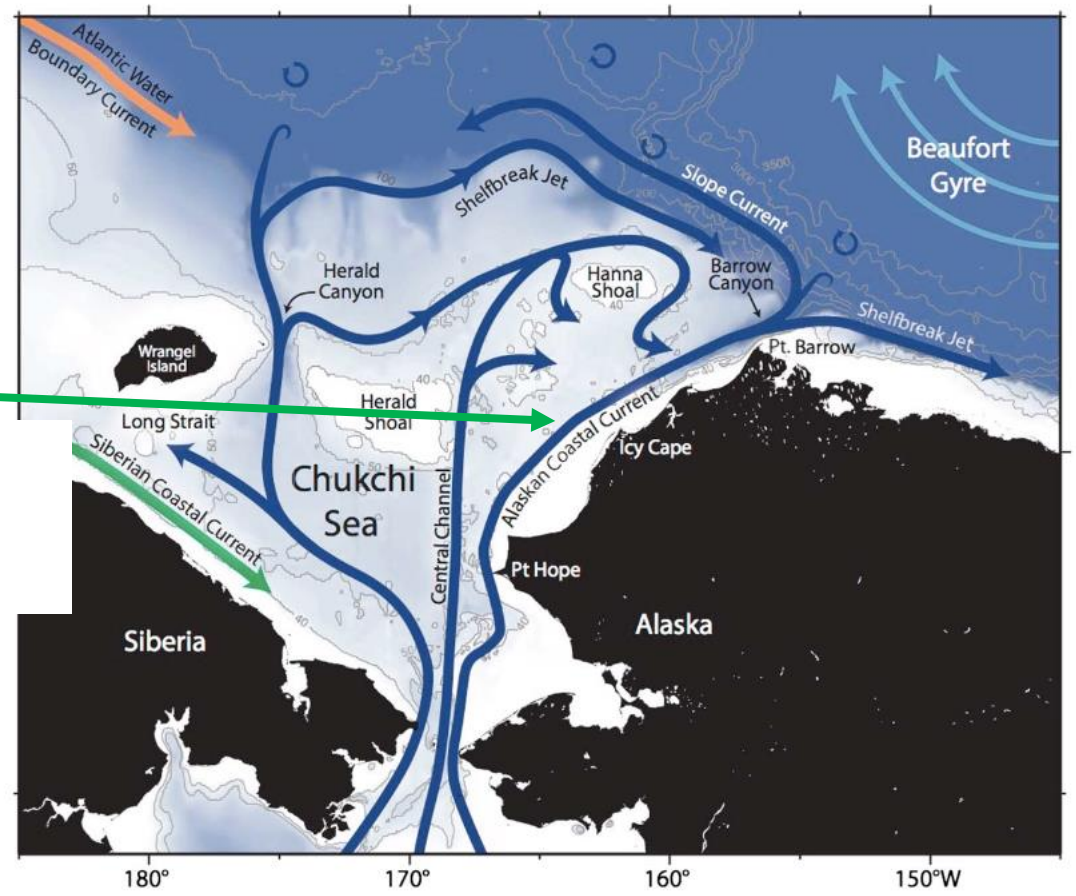
Figure 1. Schematic circulation of the Chukchi Sea and place names, after Corlett and Pickart (2017).

Typical late summer profile in the Beaufort Sea
Toole et al., 2010

Spall et al., 2018



warm, salty Pacific Summer water



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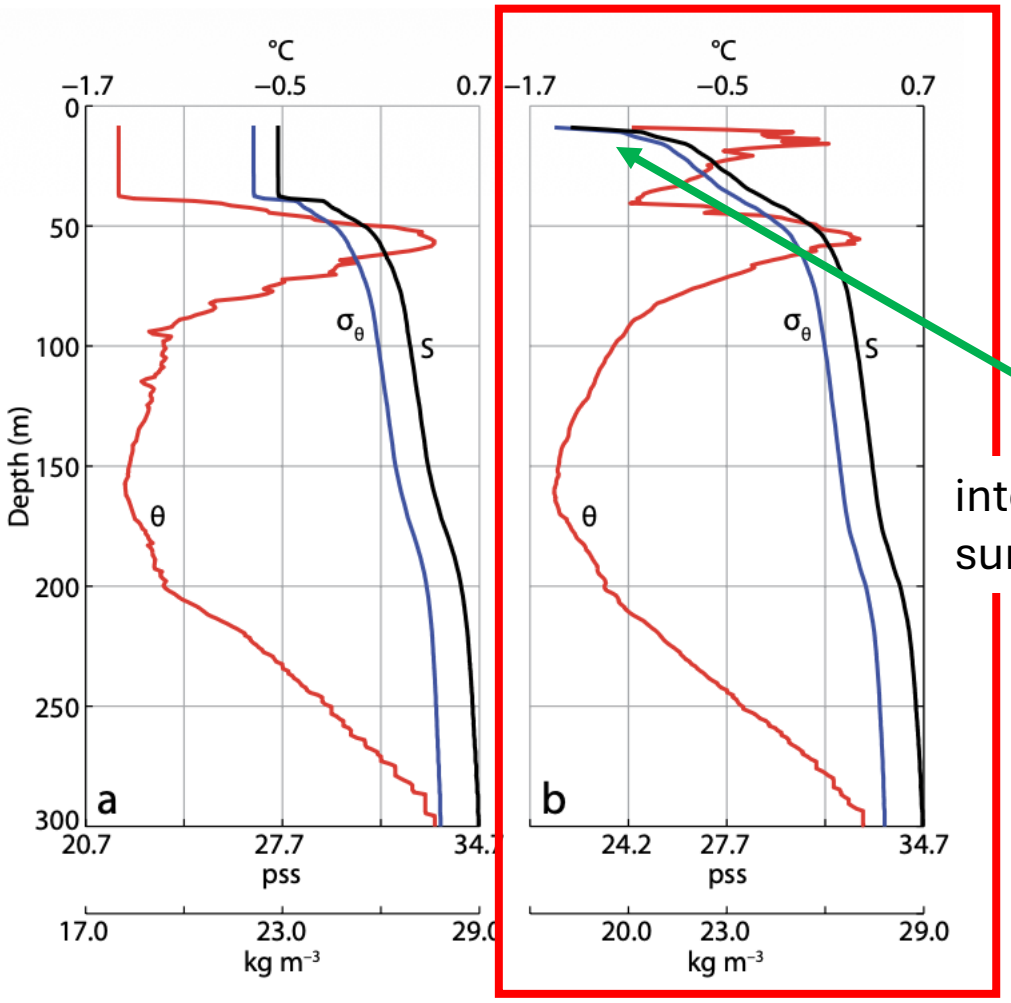
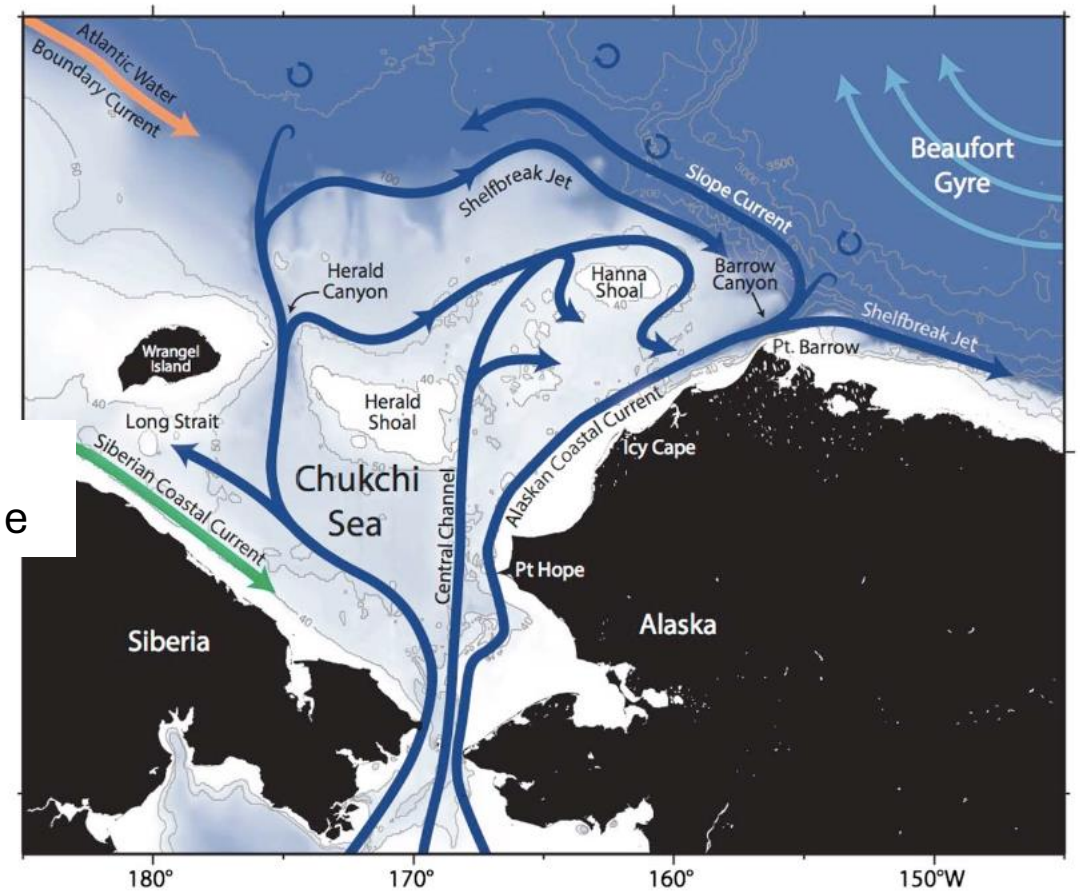


intense near-surface halocline



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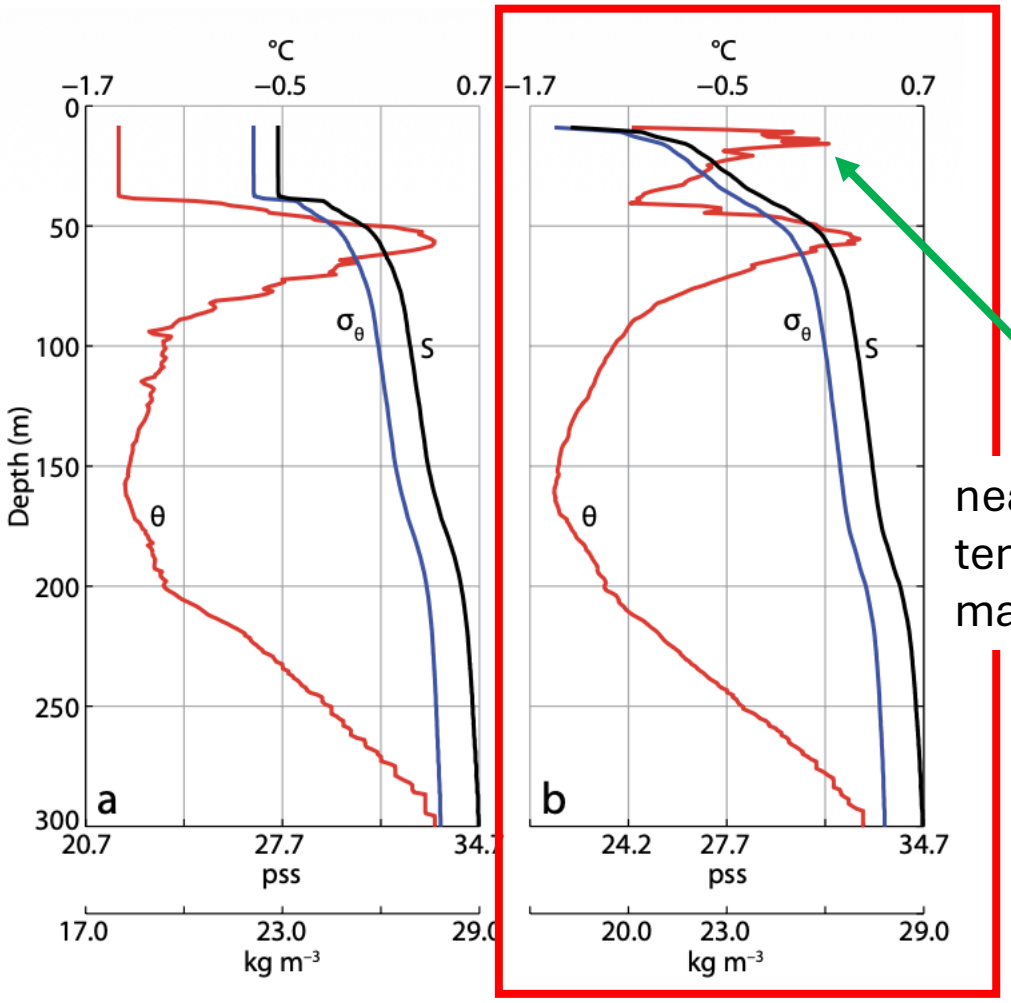
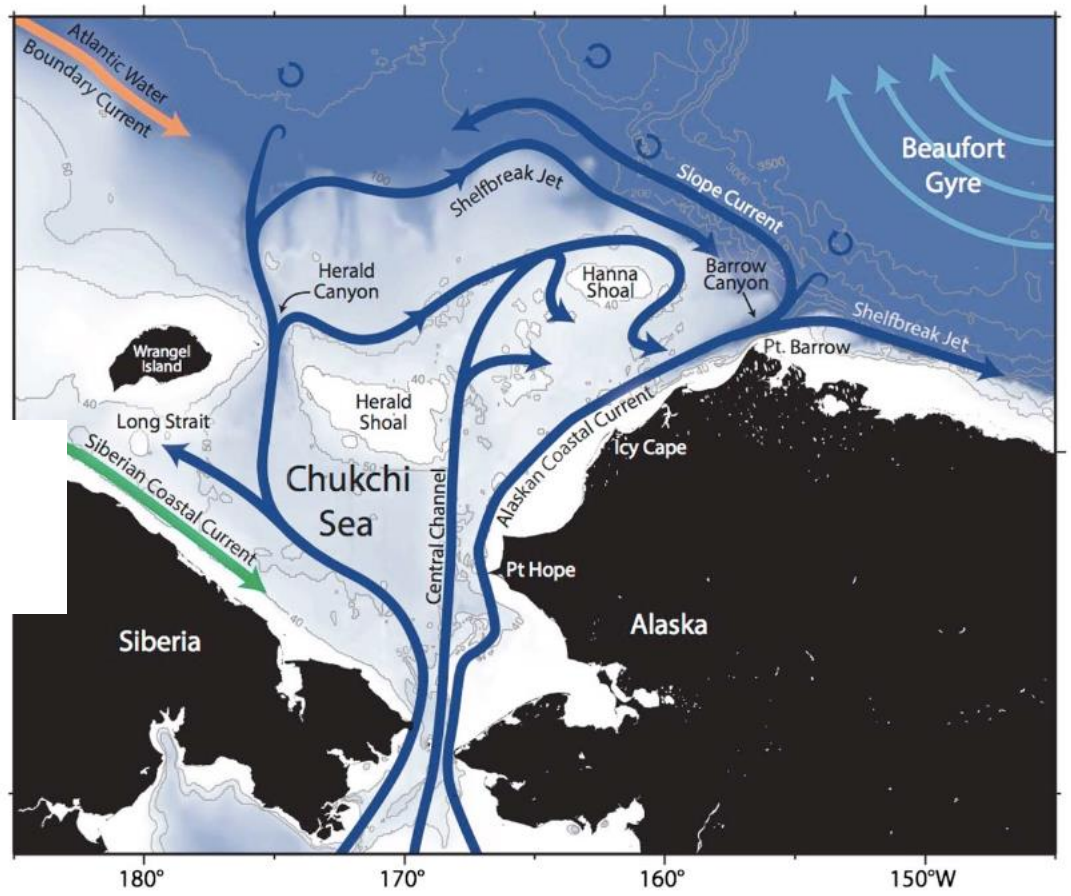


near-surface temperature maximum



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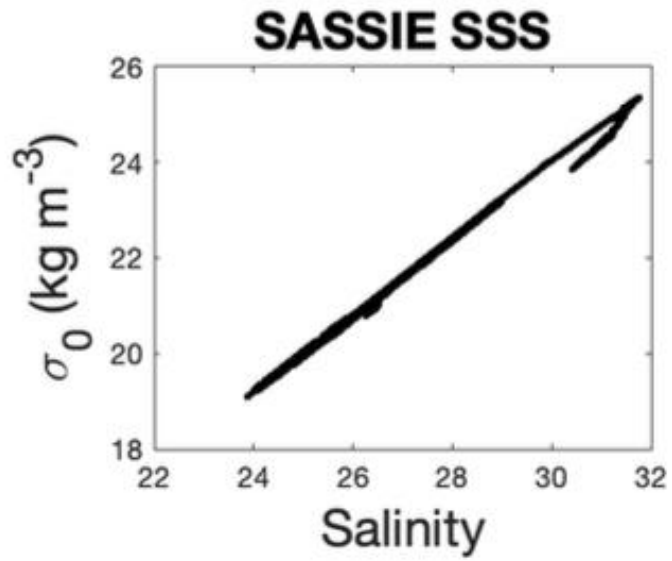
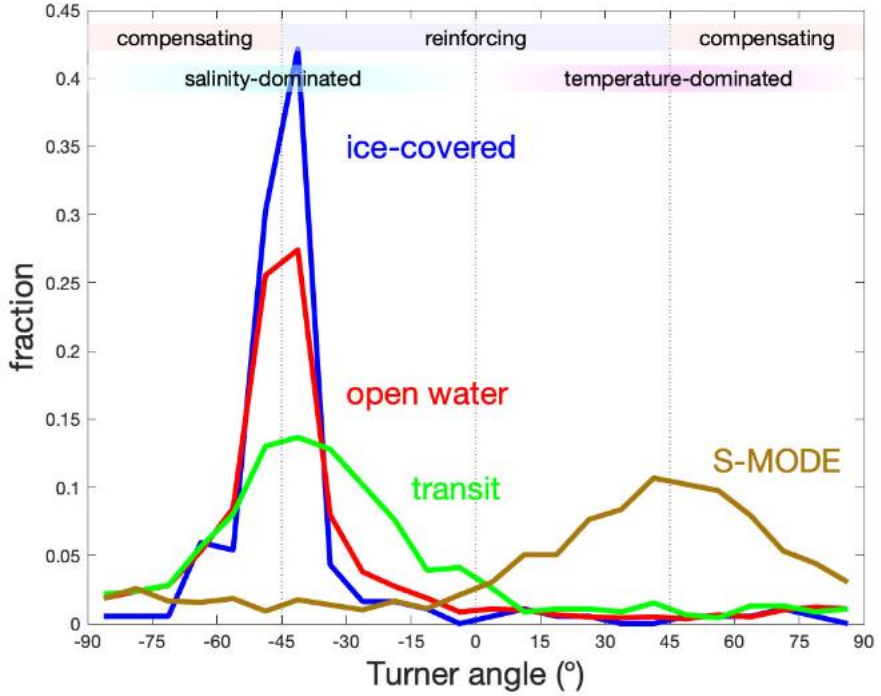


From SASSIE shipboard data

Density is completely dependent on salinity



Frequency distribution of horizontal Turner angle at 1 km scale

Bingham et al., 2026

Research Question

- What can the float observations from SASSIE tell us about the role of salinity in the formation and/or melting of sea ice in late summer / early fall?
- Can we observe the breakdown of the shallow halocline and the upwelling of heat into the near surface?

SASSIE ALTO/ALAMO Float data

Float number	Deployment location	Deployment date	Final transmission of 2022
11131 - ALTO	72.25 N, 153.04 W	8 September 2022	10 October
11132 - ALTO	72.25 N, 150.00 W	8 September 2022	14 October
11133 - ALTO	72.25 N, 154.95 W	8 September 2022	14 October
11136 - ALTO	72.25 N, 151.51 W	8 September 2022	24 October
9097 - ALAMO	72.5 N, 145.0 W	15 September 2022	12 October
9101 - ALAMO	72.0 N, 149.5 W	19 September 2022	4 October
9098 - ALAMO	73.12 N, 150.5 W	25 September 2022	12 October

Table 8. Deployment Dates and locations of the ALTO and ALAMO floats. Three additional ALAMO floats were deployed (two on 9 September 2022 and one on 10 September 2022) but did not collect any data.

deep (~450 m)
nominal 6-hour sampling

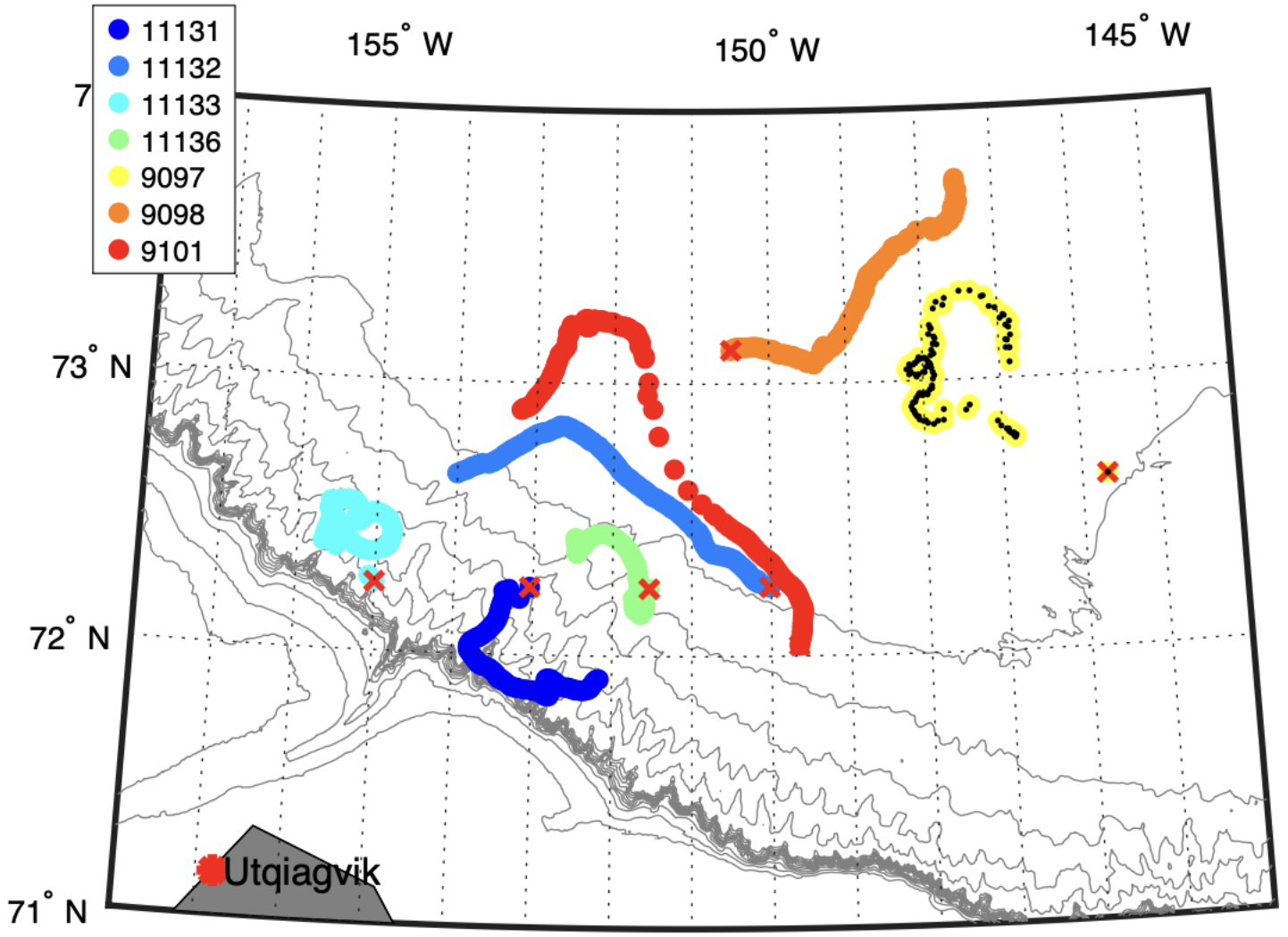
shallow (~250 m)
nominal 2-hour sampling

Drushka et al., 2024

Float tracks

red X's are deployment locations

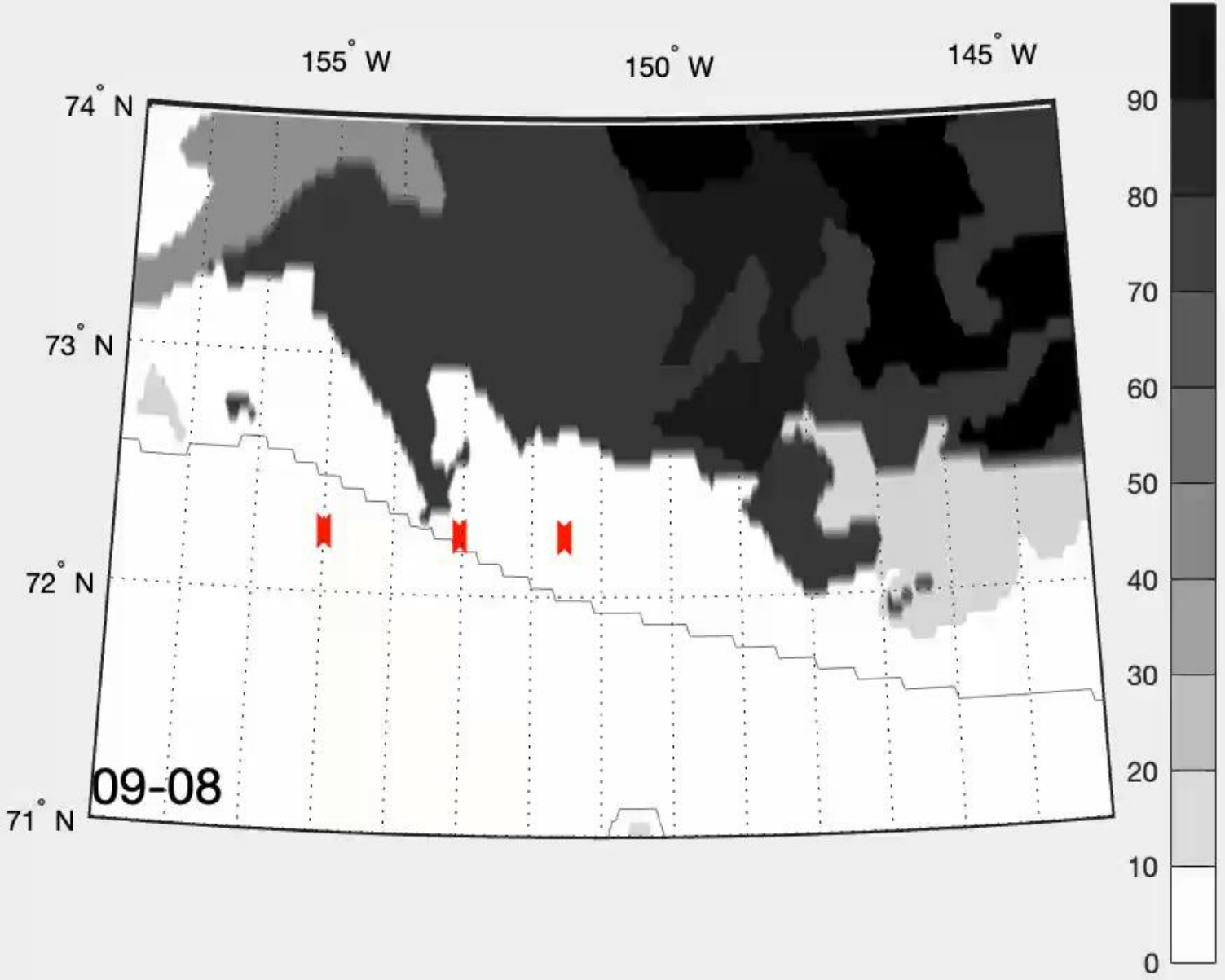
Bathymetry contours are every 100m 100-1000 and every 500 m 1500-4000



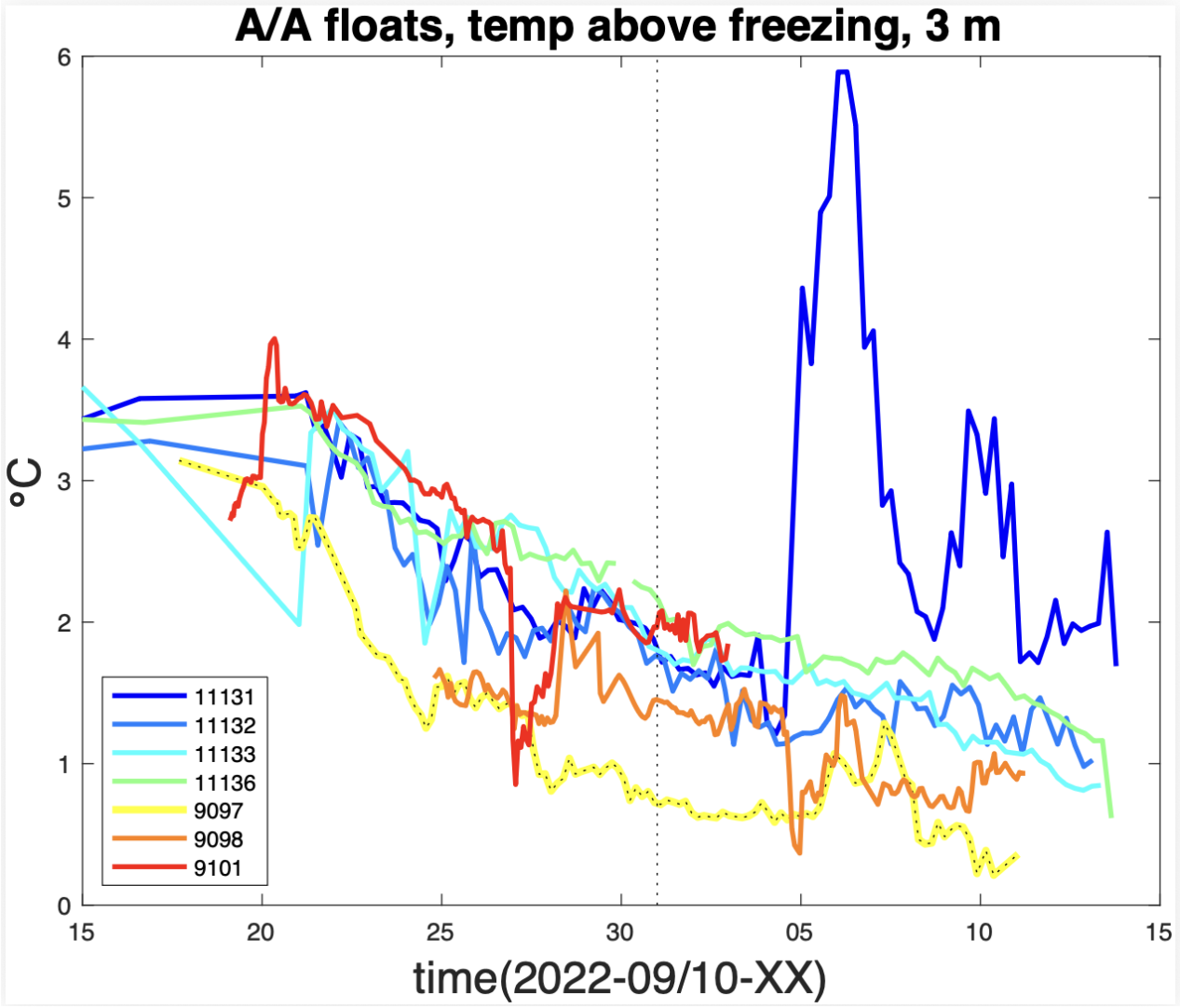
Ice concentration (%) from NWS ice product (Pacini et al., 2025)

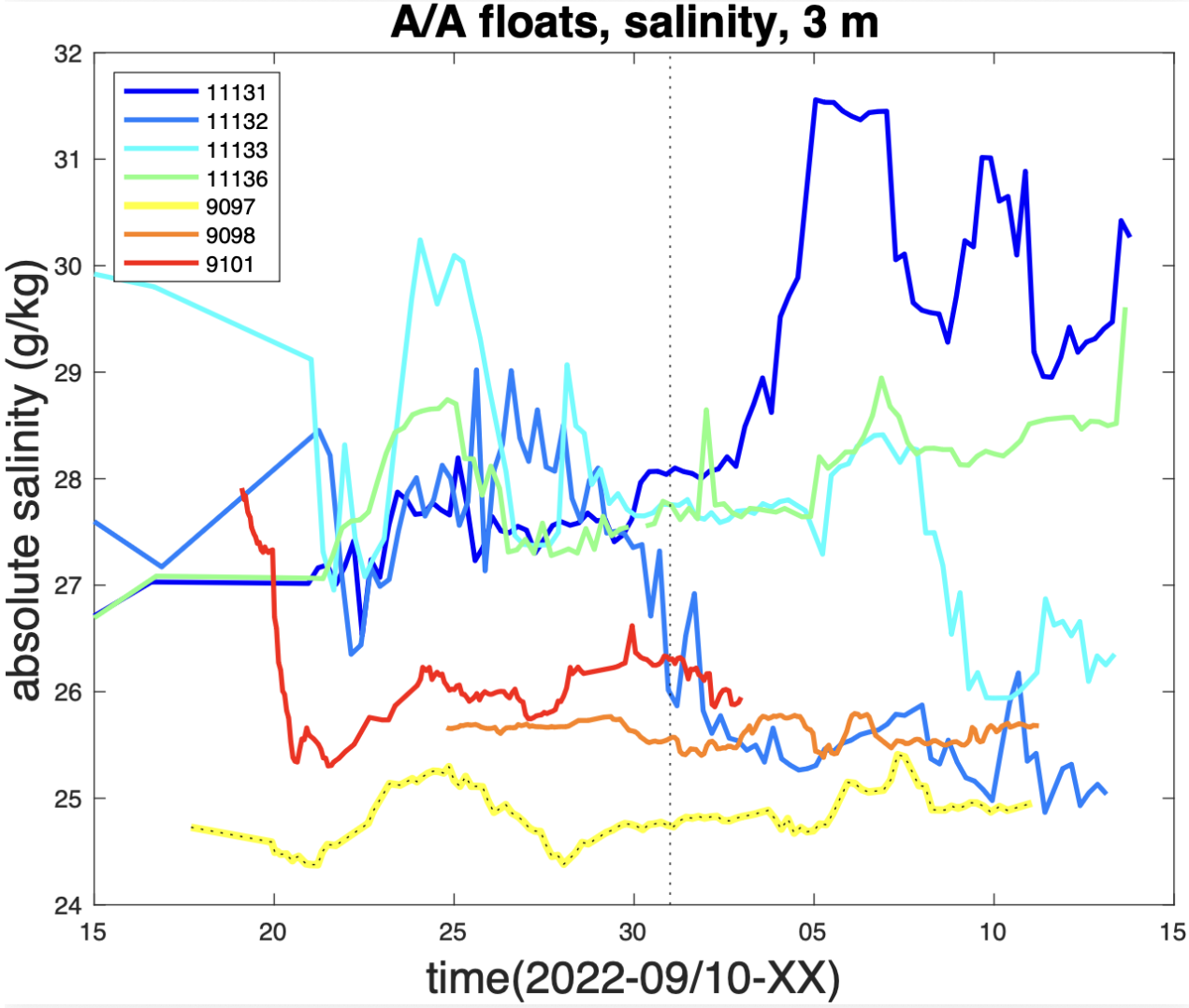
Thin line is zero concentration

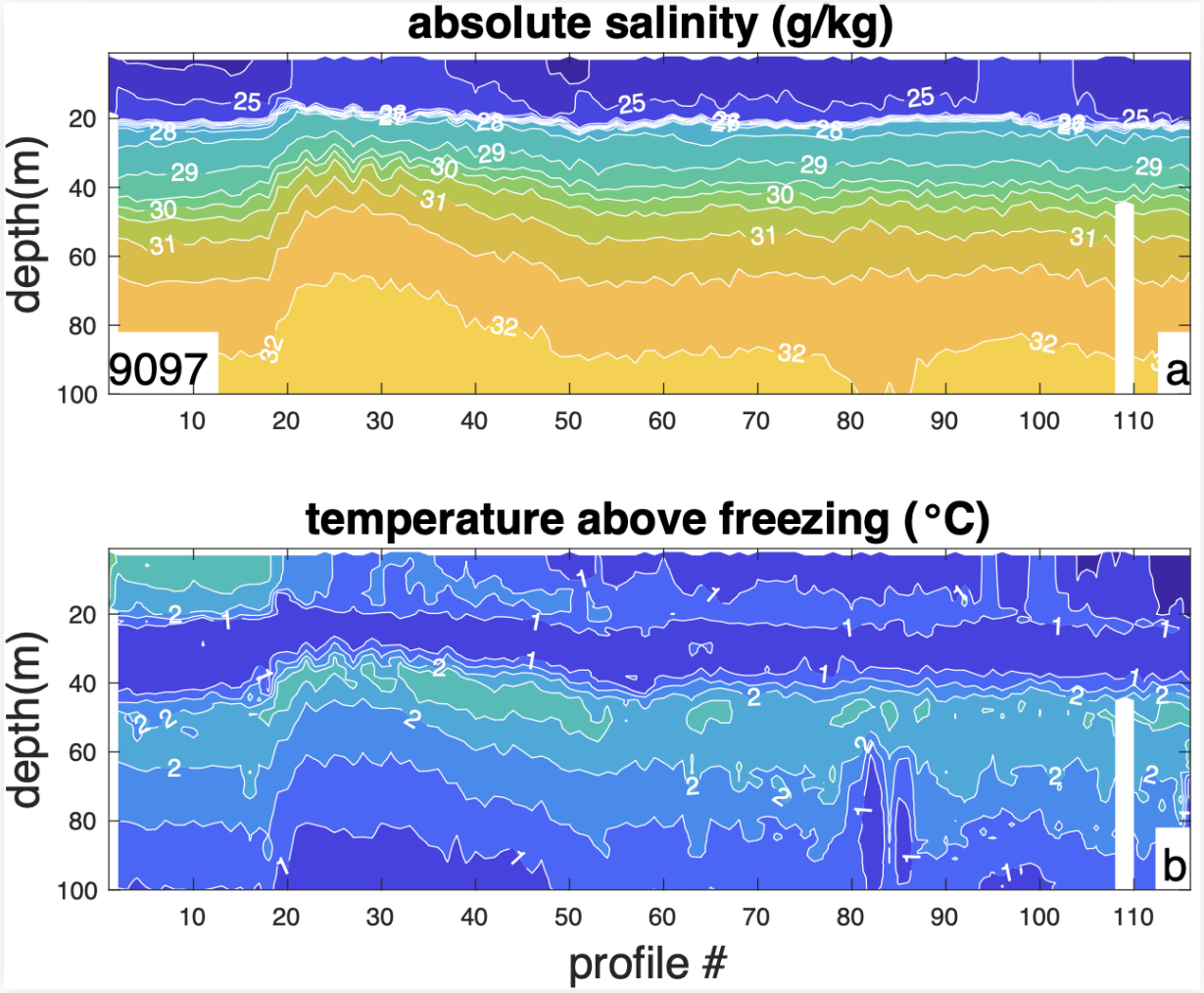
Date is shown at bottom left (MM-DD)

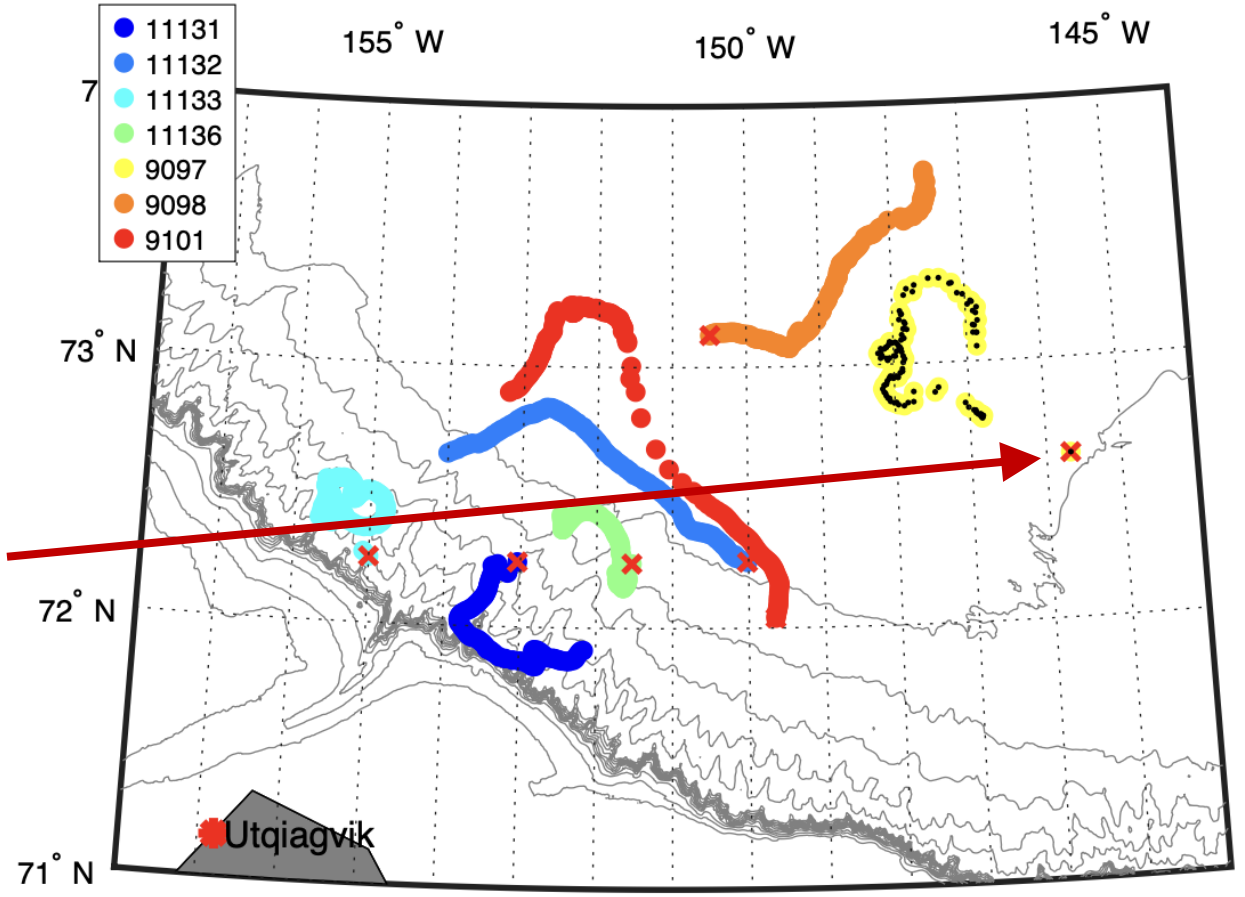


Near-surface temperature and salinity as a function of time






absolute salinity (g/kg)
depth(m)
9097
a
temperature above freezing (°C)
depth(m)
b
profile #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72° N
71° N
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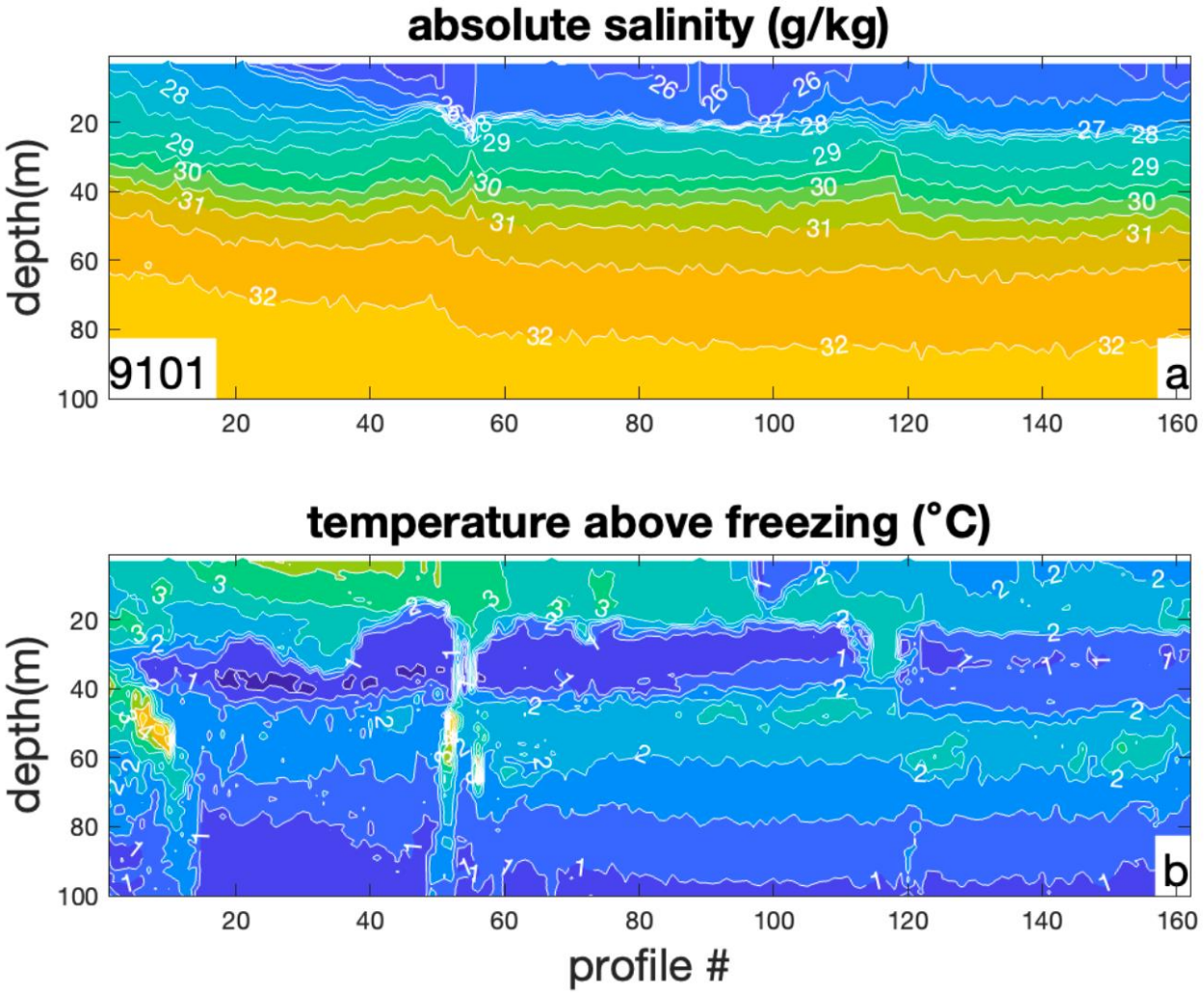
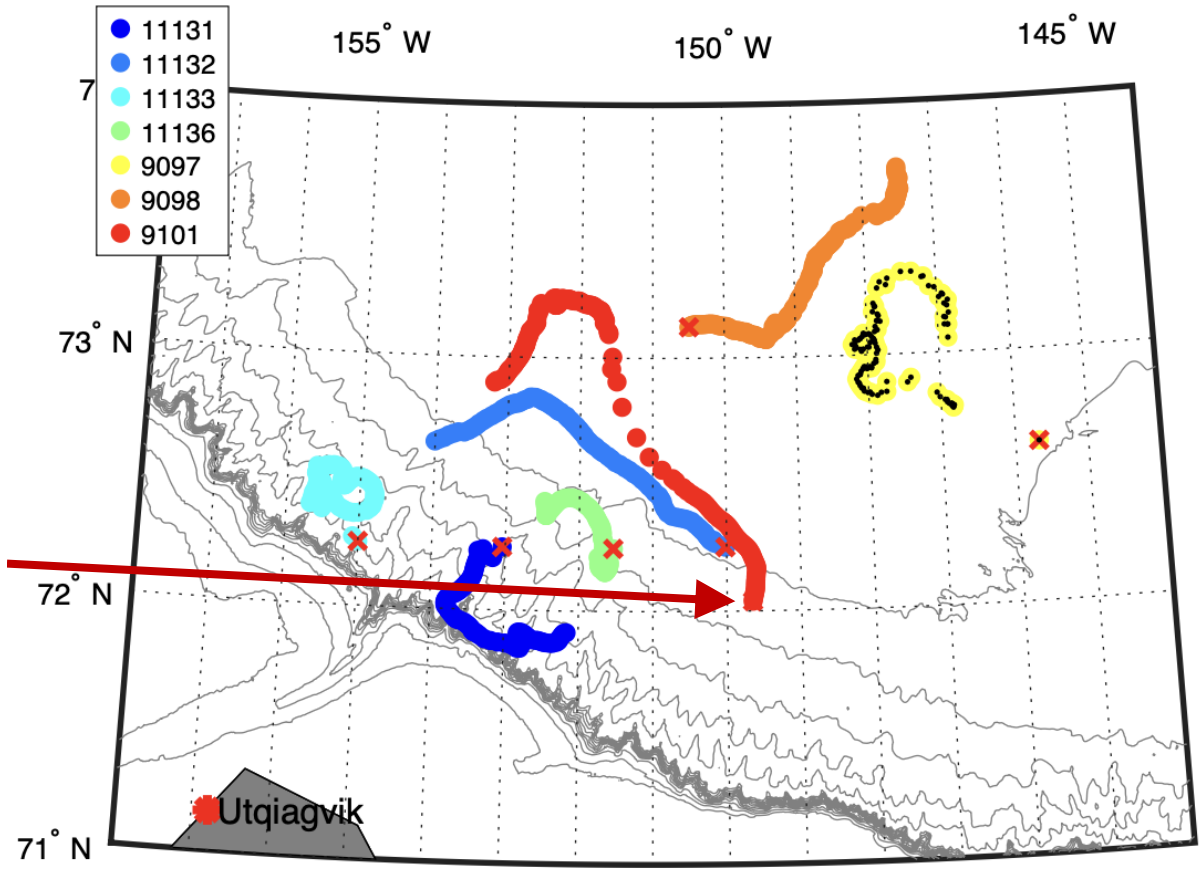

absolute salinity (g/kg)
depth(m)
9101
a
temperature above freezing (°C)
b
profile #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155° W
150° W
145° W
73° N
72° N
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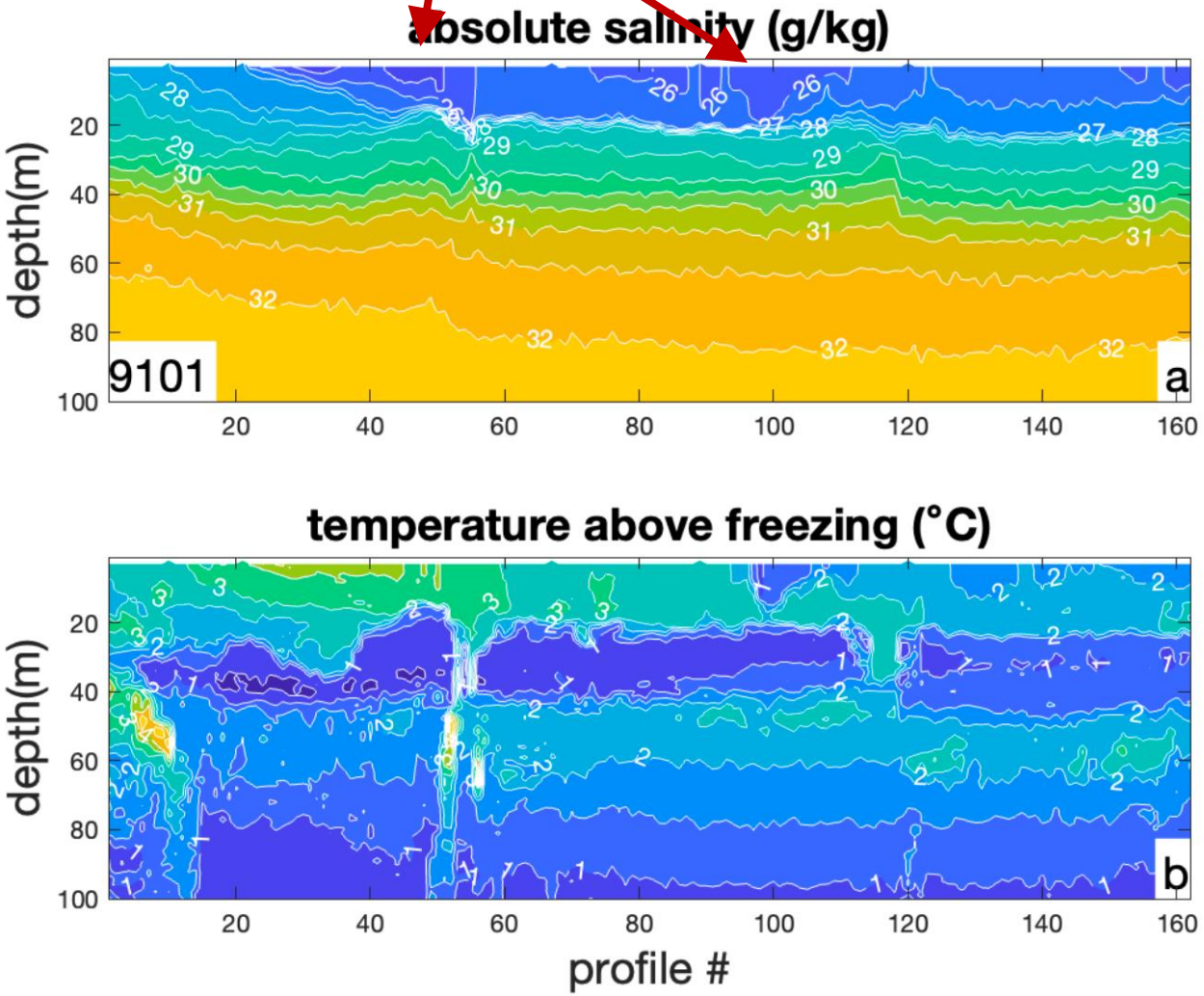
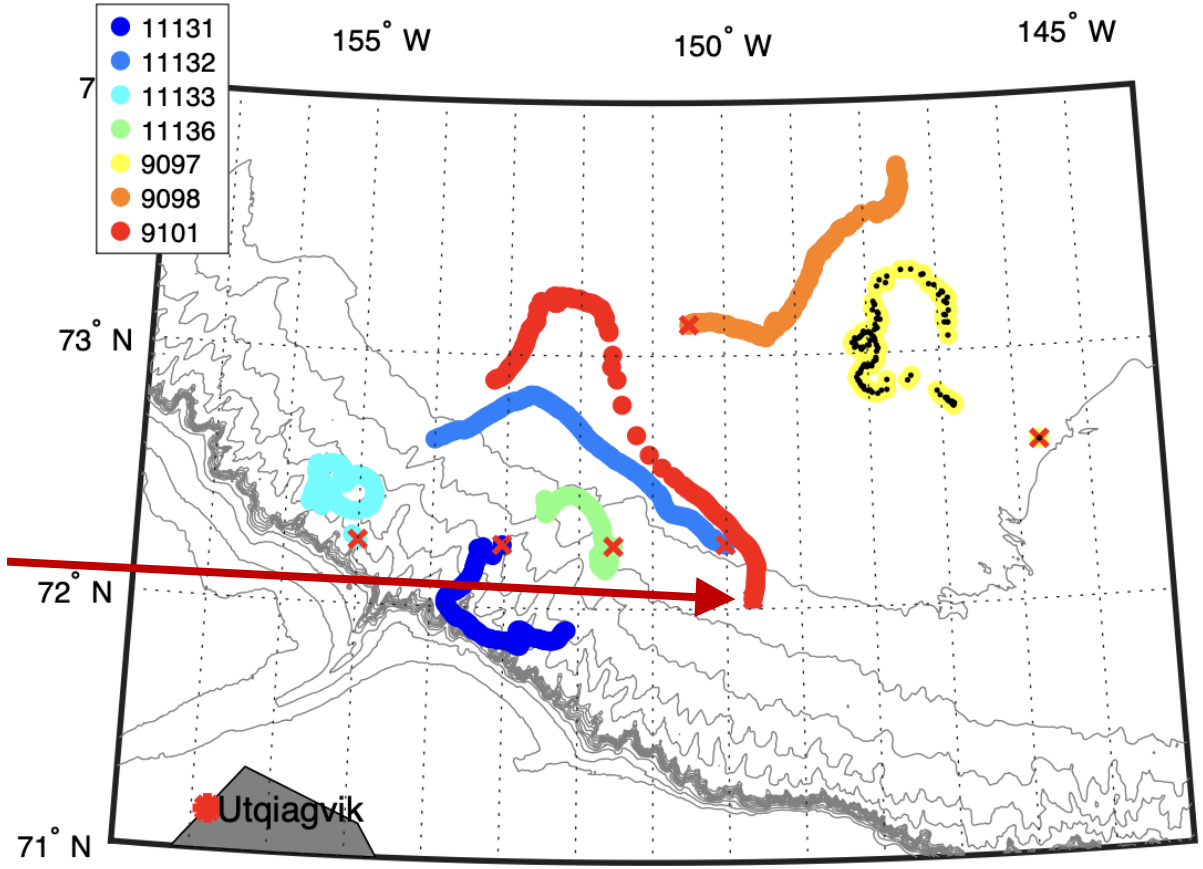
Fresh events at the surface

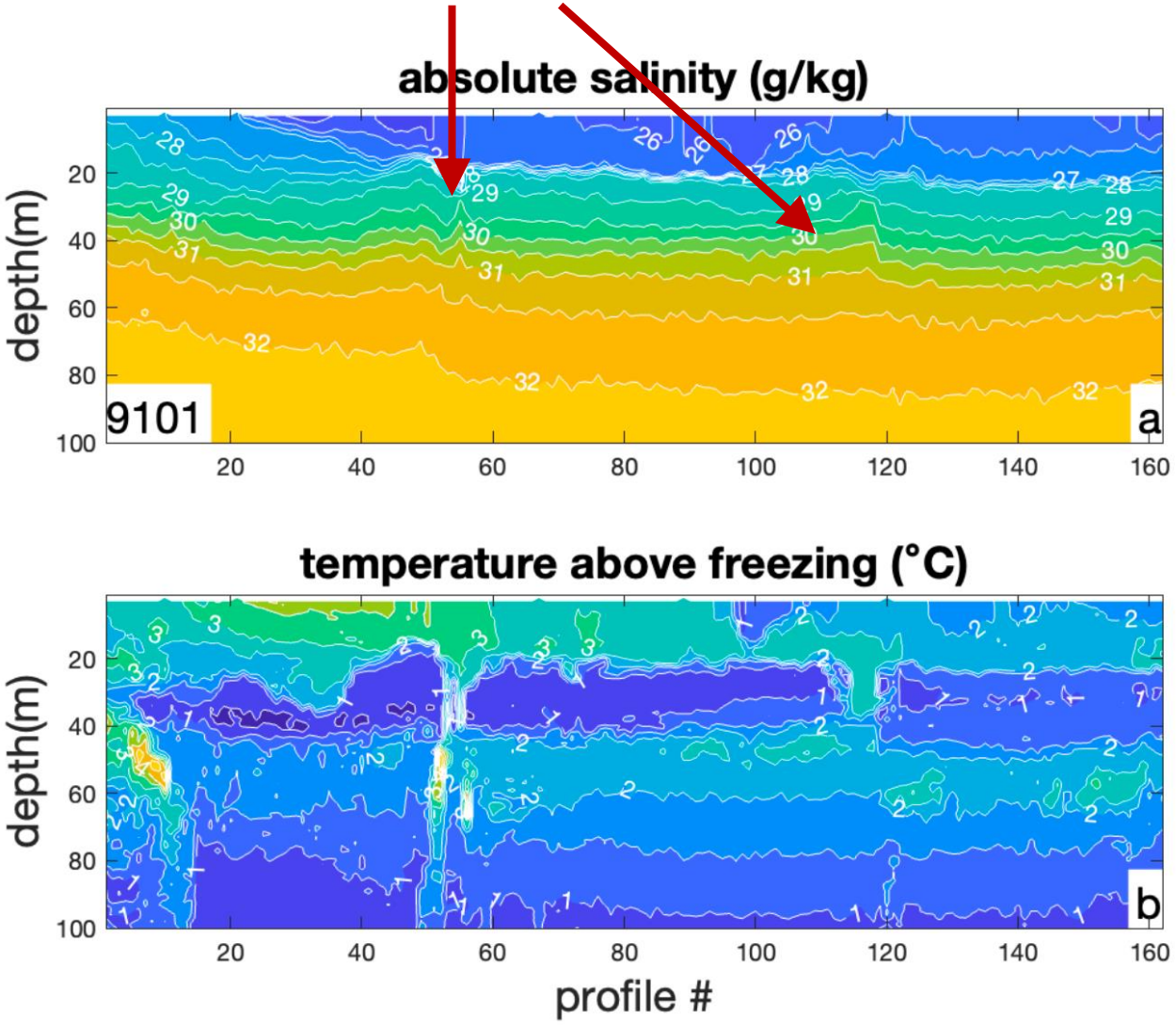
precipitation or river runoff?

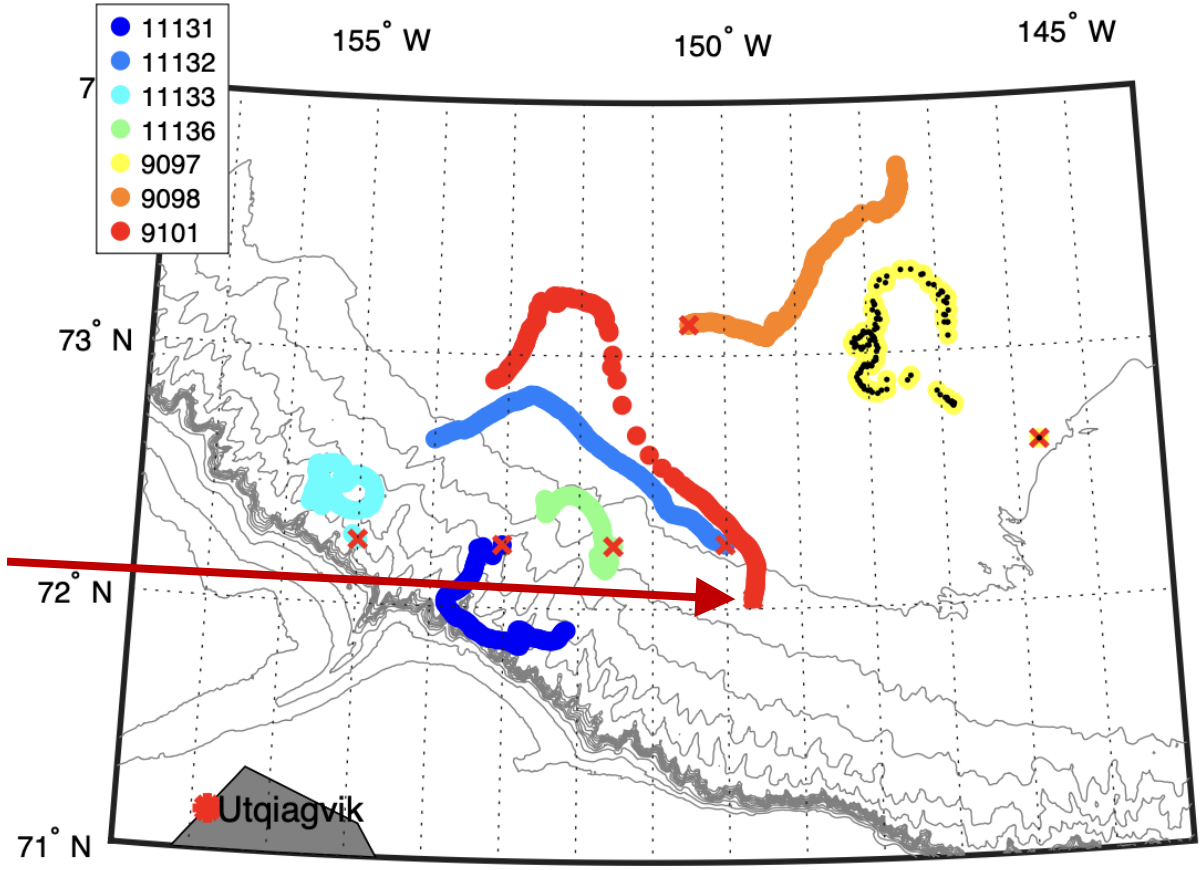
fossil meltwater?

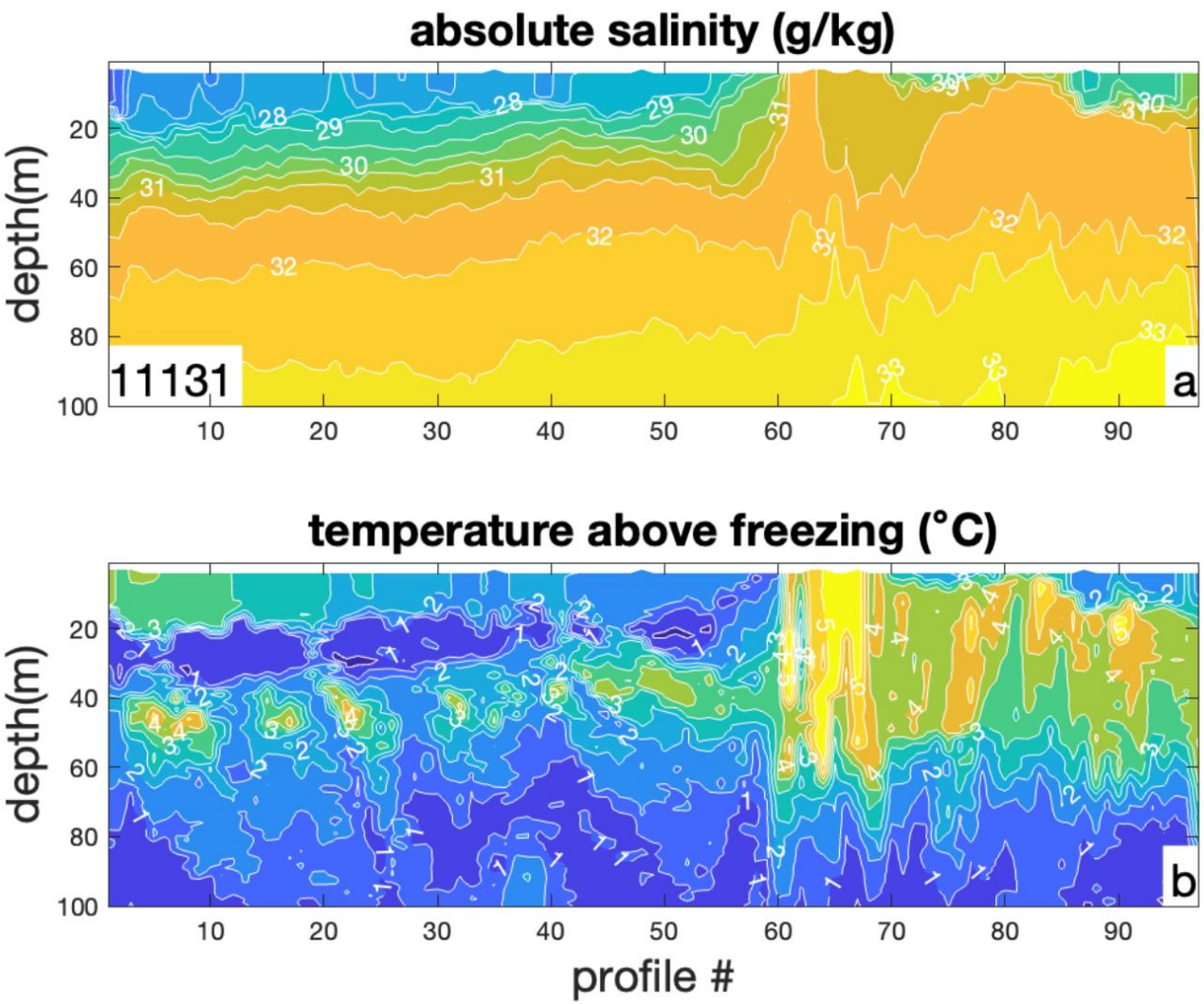




Short spatial-scale variability at depth and possible upwelling of PSW






absolute salinity (g/kg)
depth(m)
11131
a
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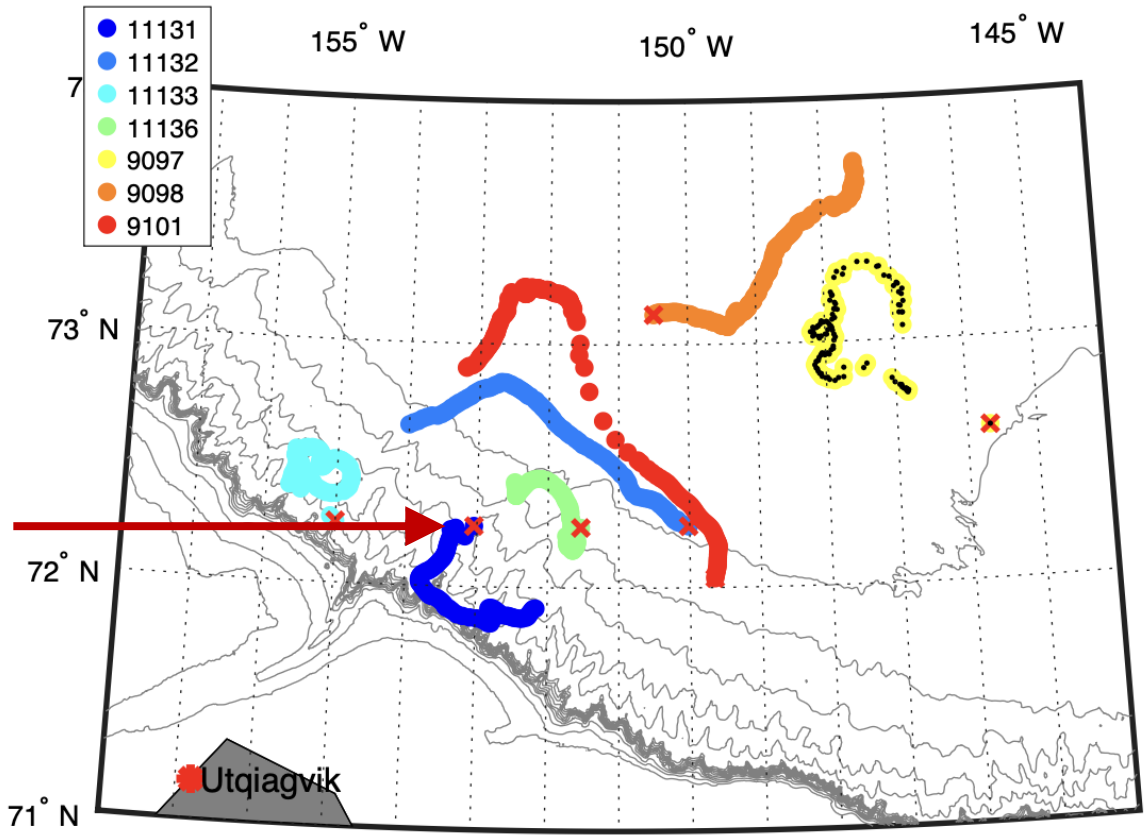
profile #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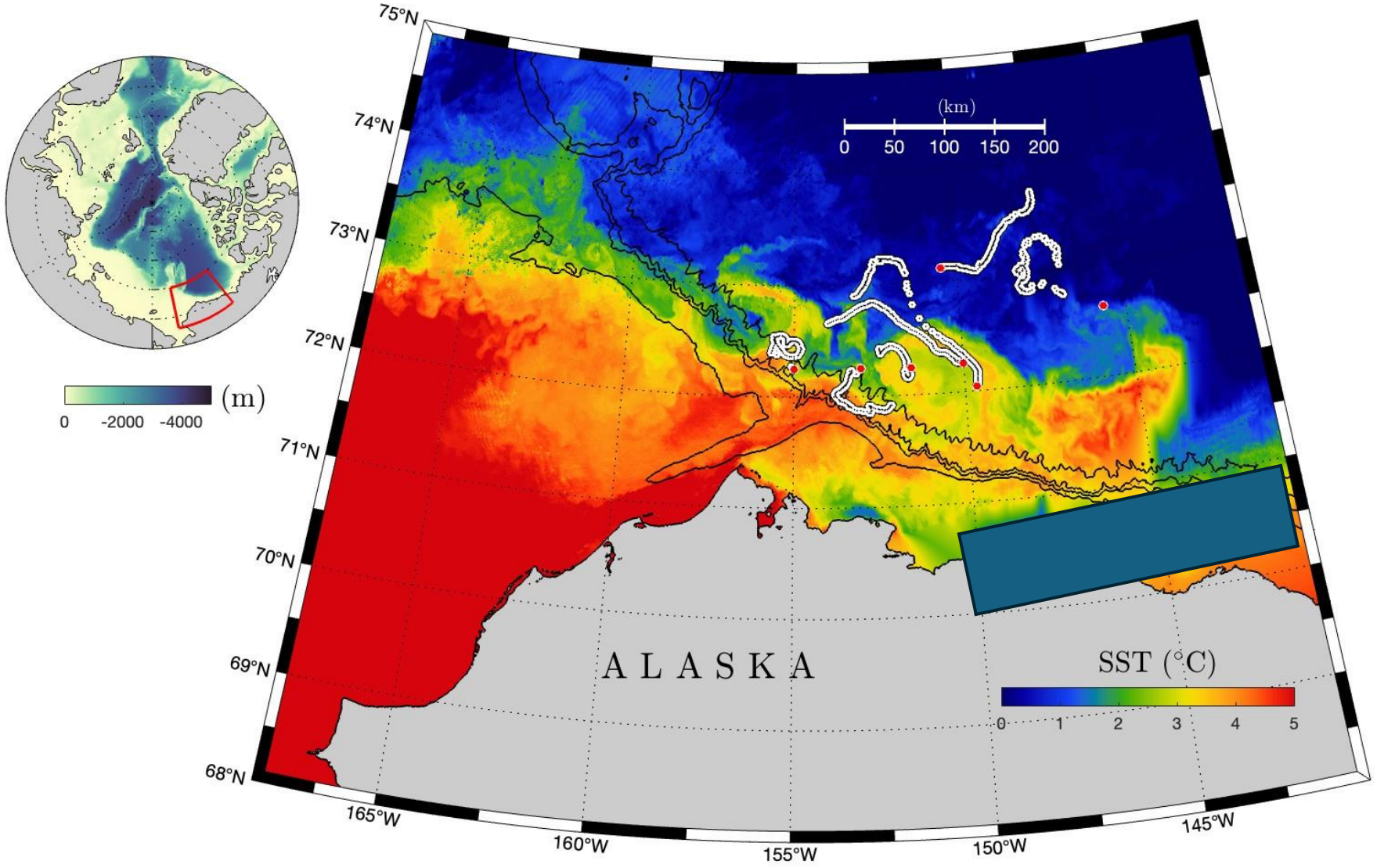
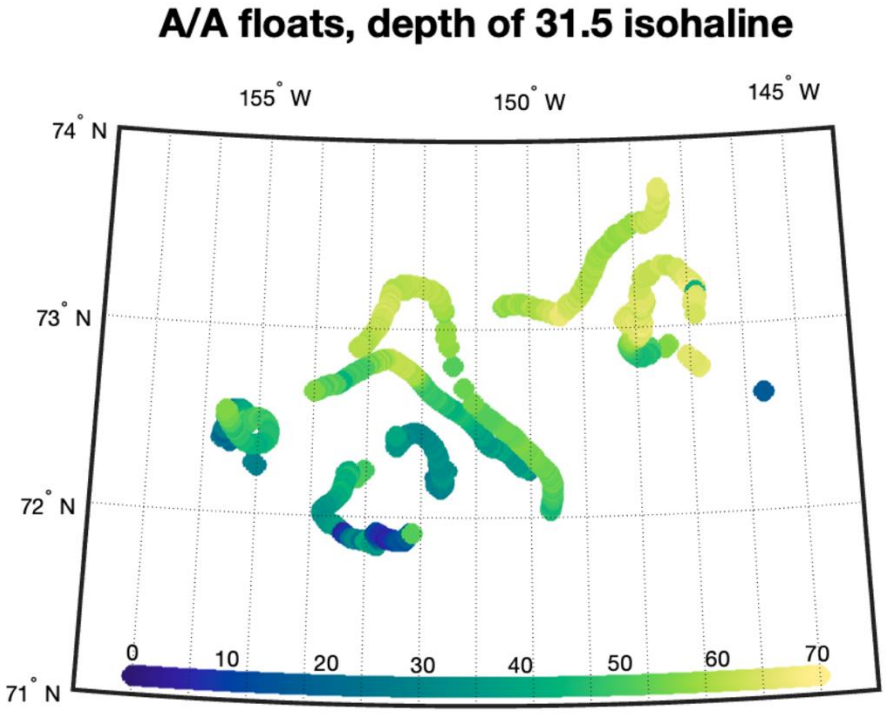
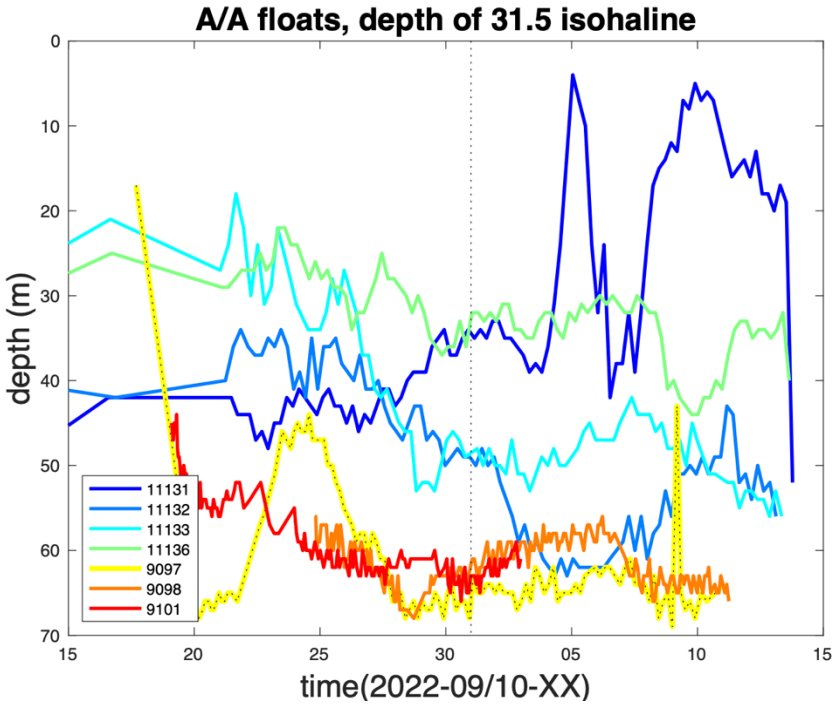


SST from VIIRS on 9 September 2022.

Red dots are deployment locations of floats

31.5 Isohaline depth





31.5 is a typical isohaline associated with Pacific Summer Water

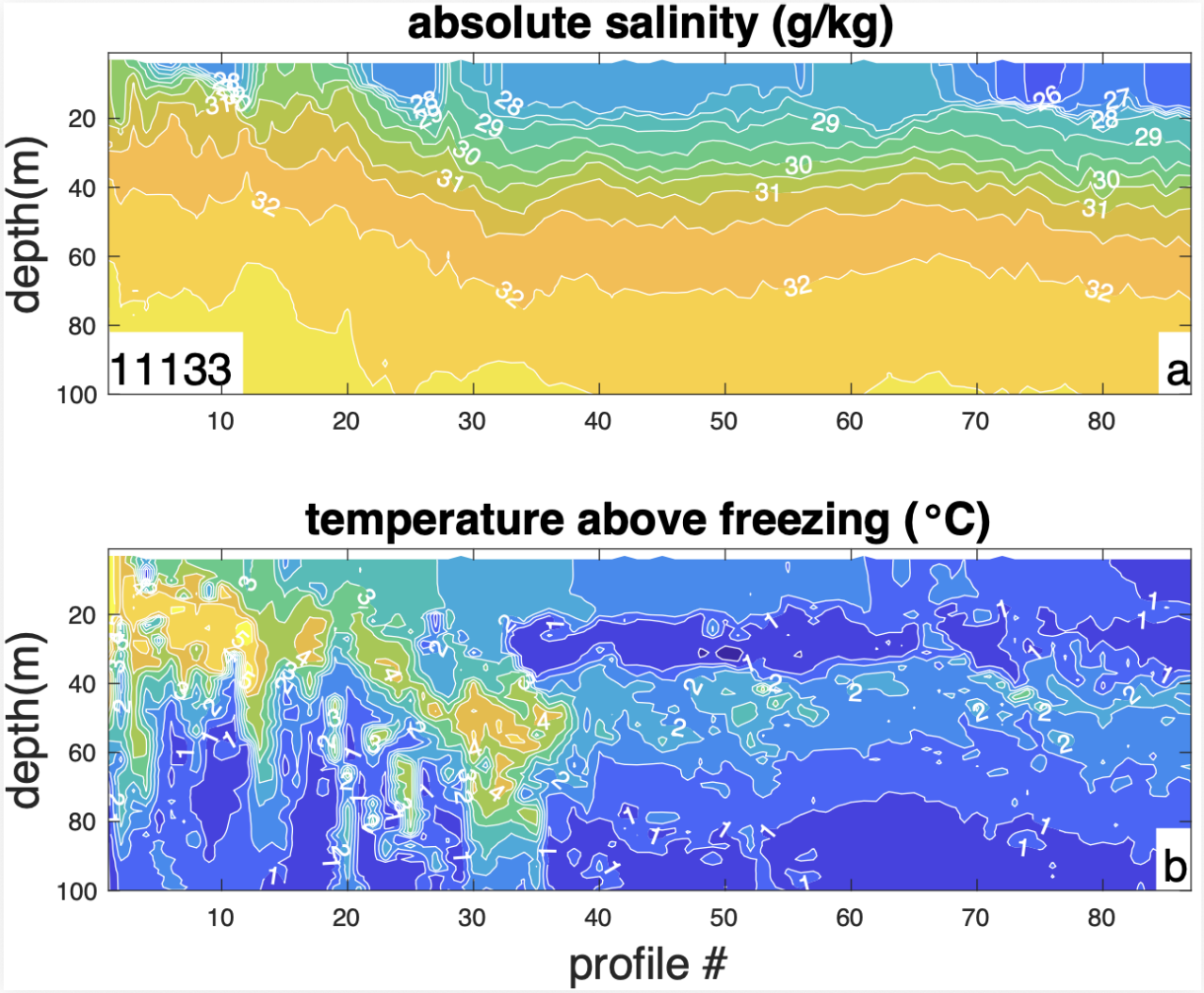
For the northeastern floats (warm colors), the 31.5 isohaline was deep and stable. For the others, the isohaline depth varied strongly

Isohaline generally gets deeper to the northeast

Preliminary conclusions

- Four of the seven floats participate in a large cyclonic circulation just offshore of the shelf break
- This circulation has a domed salty core with a weak halocline, that facilitates upwelling of warm water – suppression of ice formation?
- The floats to the northeast show an ordered vertical structure with a strong halocline at ~20 m depth
- These floats sampled regions of ice melting and formation – the halocline may have facilitated both
- These float observations demonstrate the intimate connection between salinity, stratification and sea ice formation – a major goal of SASSIE


Questions?


absolute salinity (g/kg)
depth(m)
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a
temperature above freezing (°C)
depth(m)
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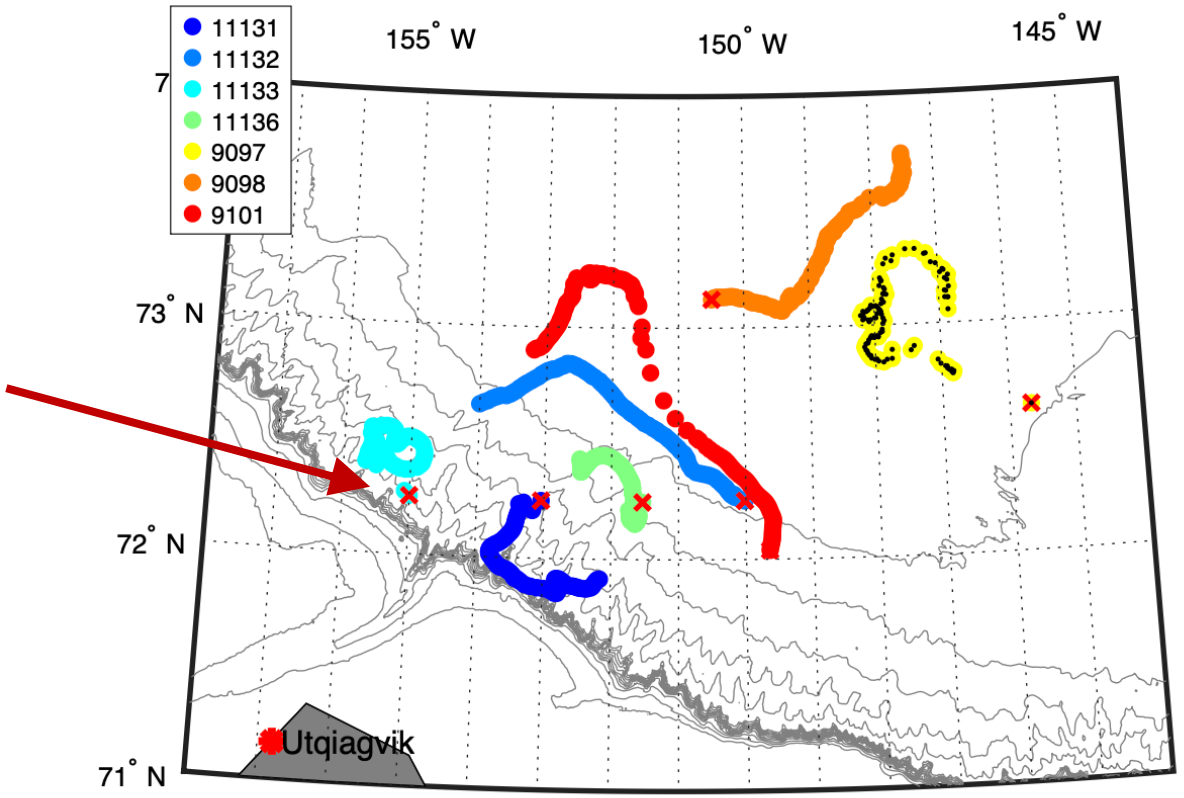
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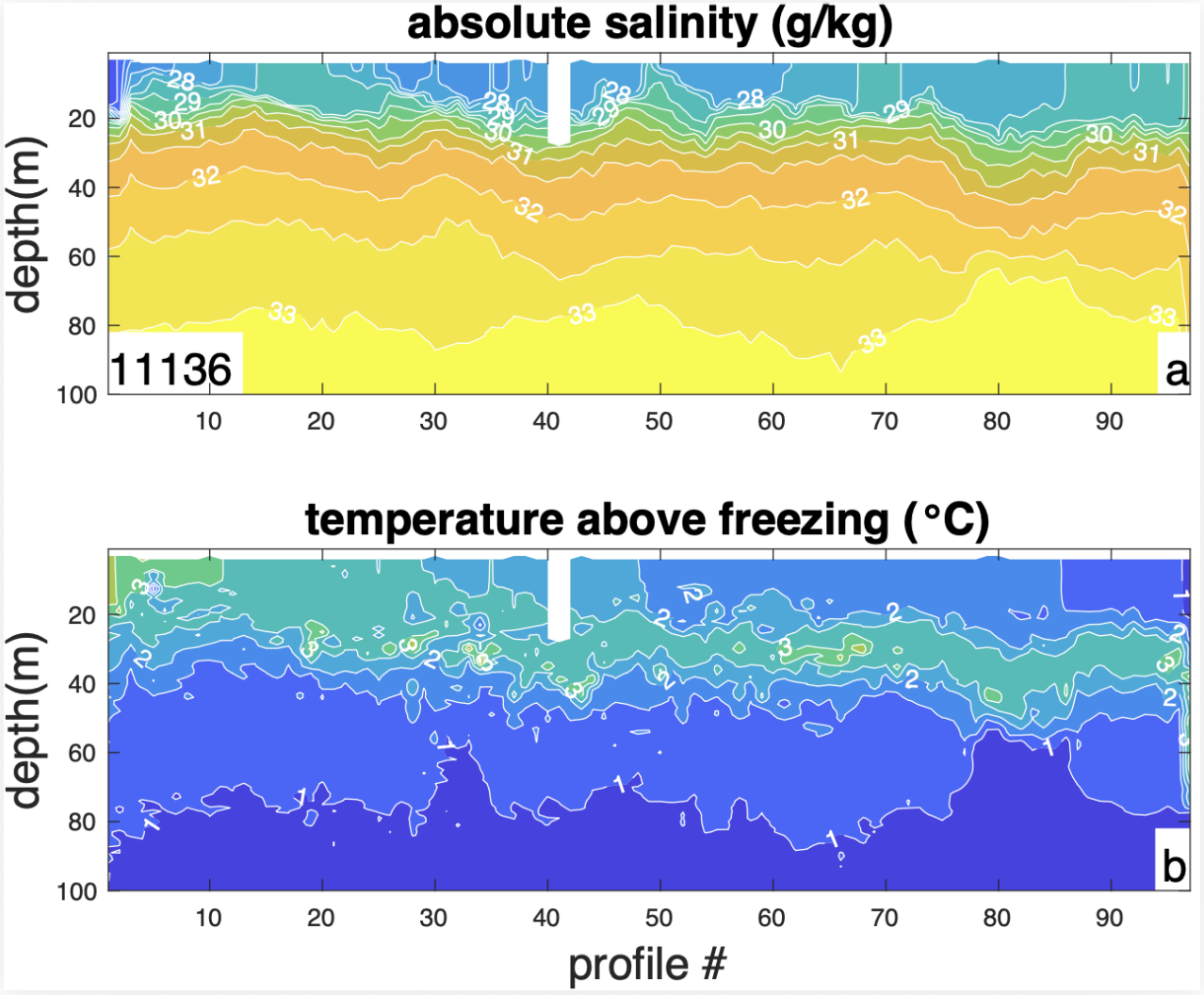
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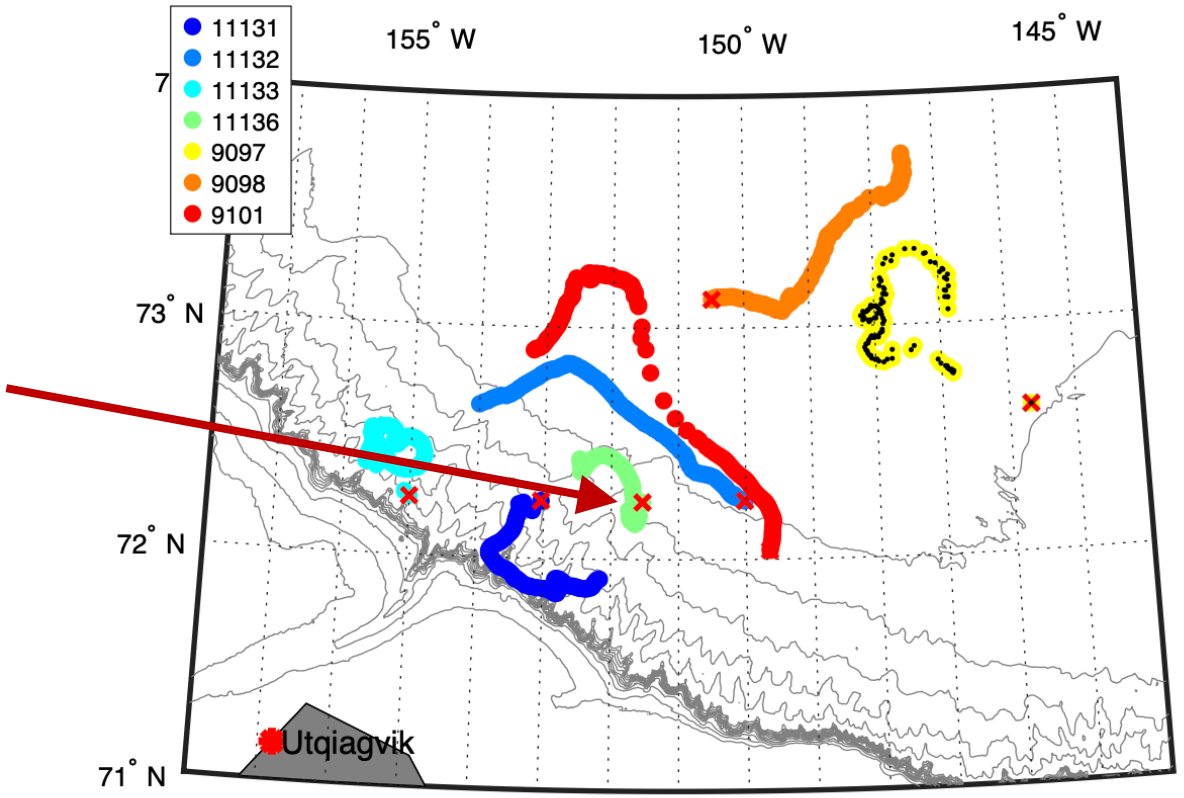
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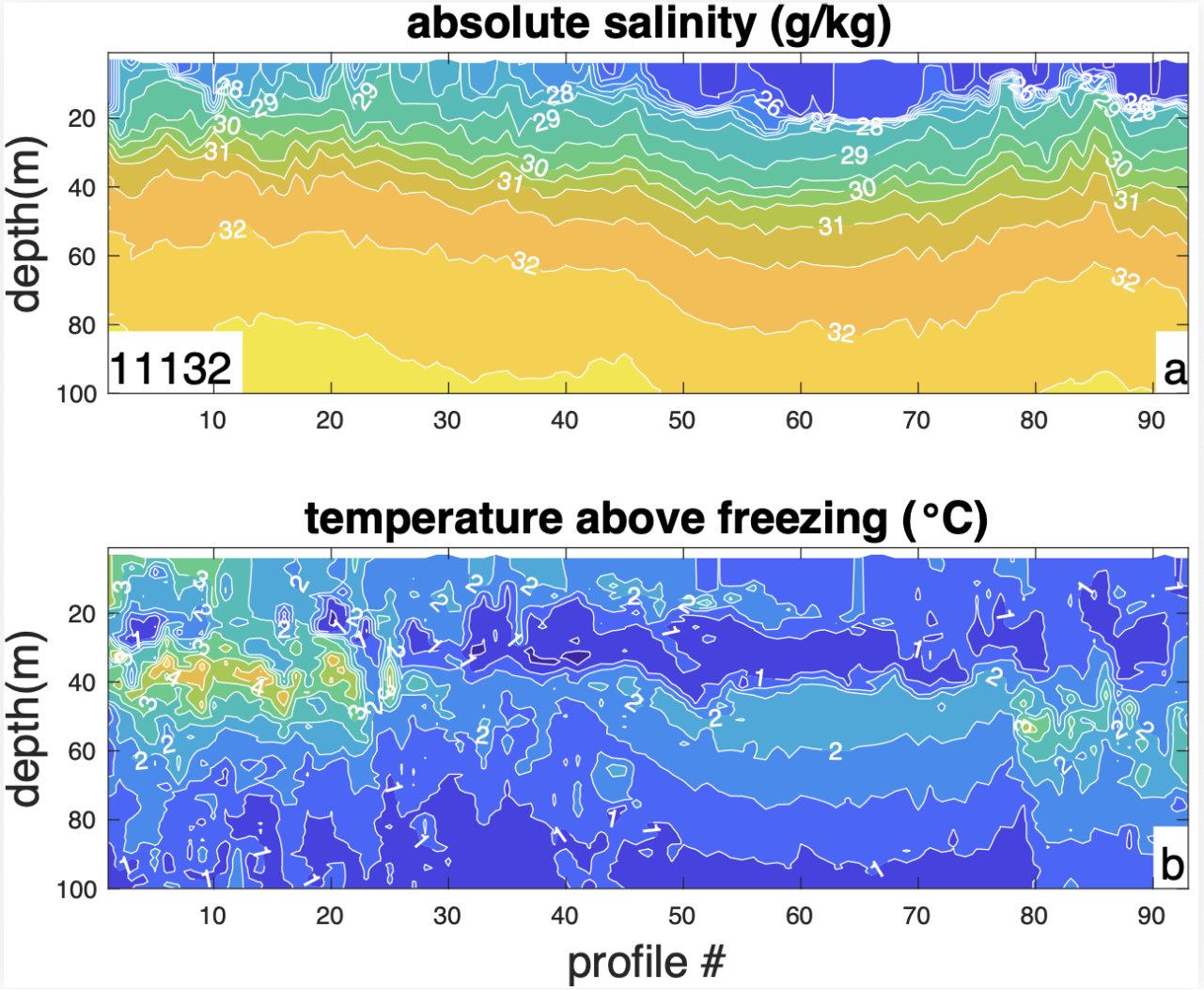
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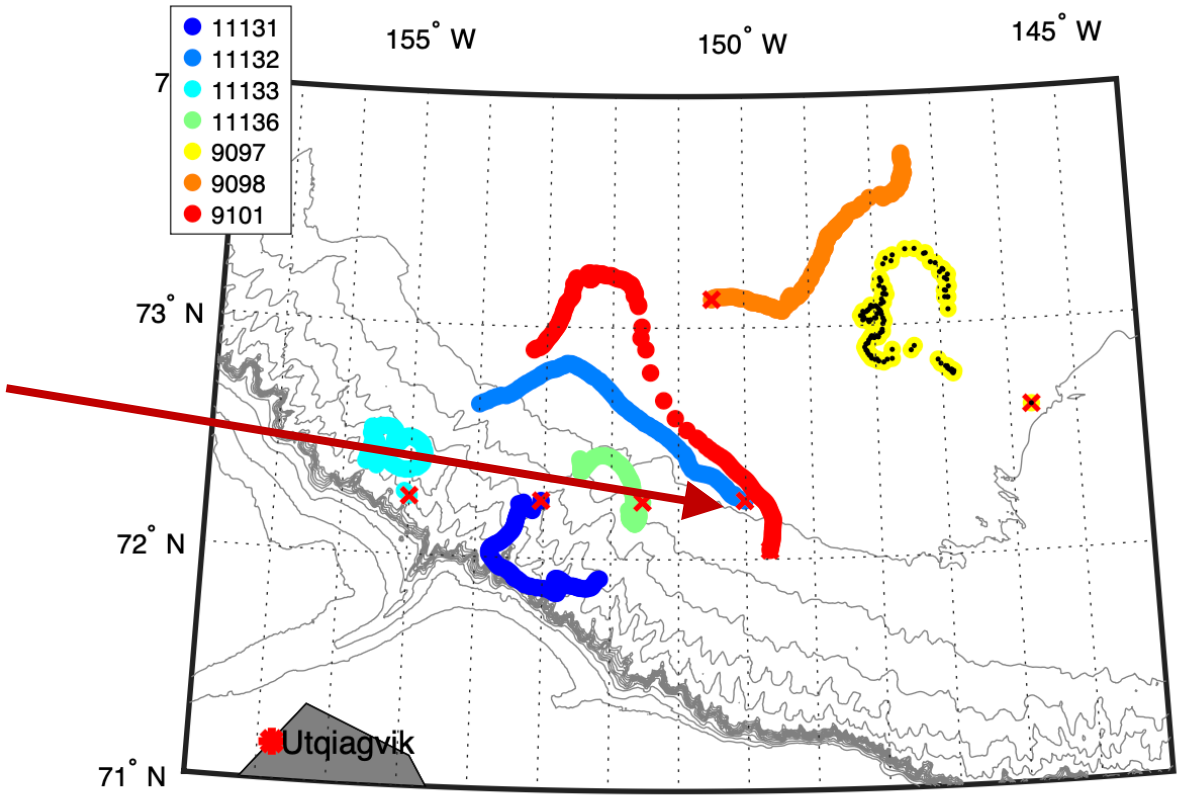
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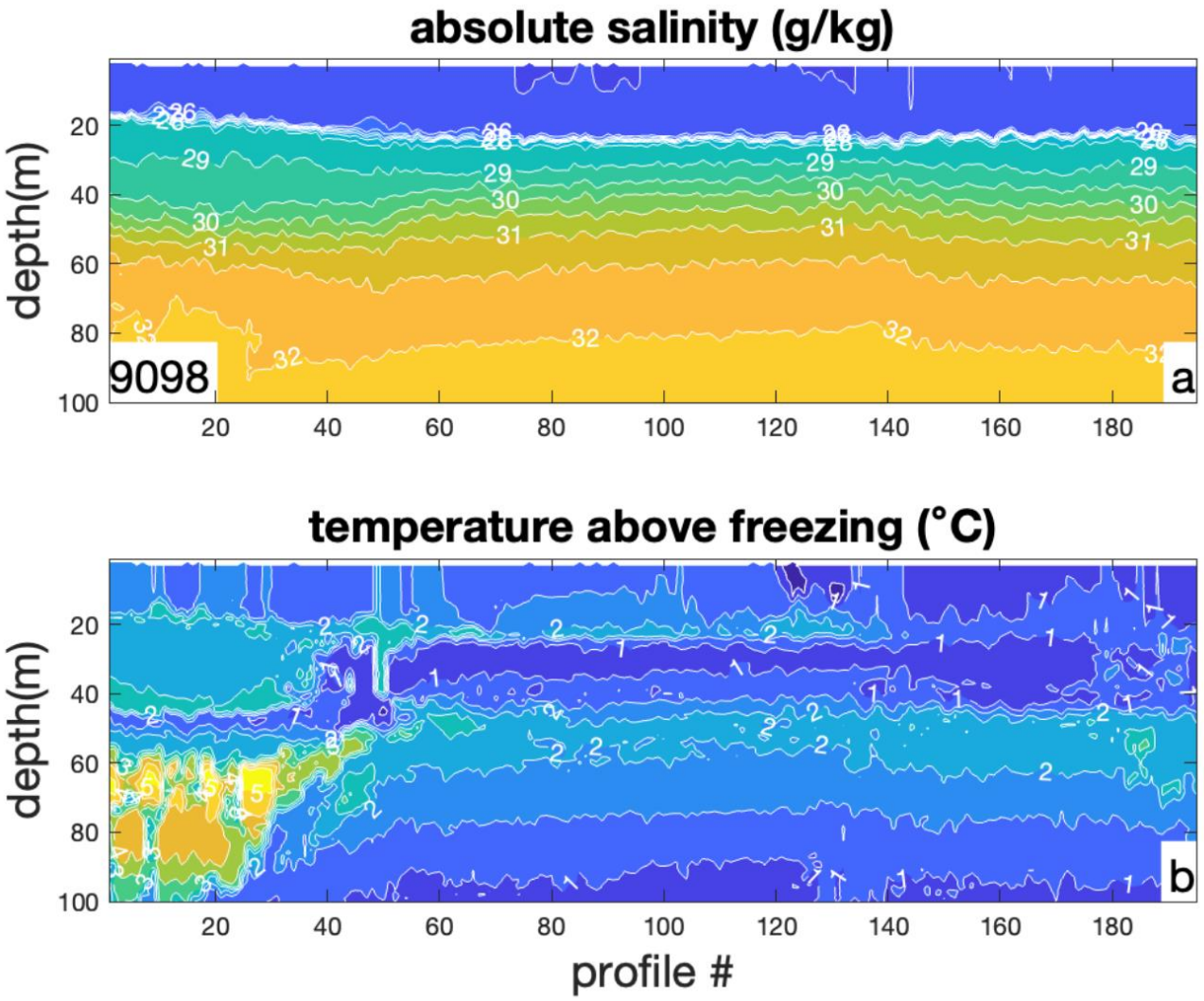
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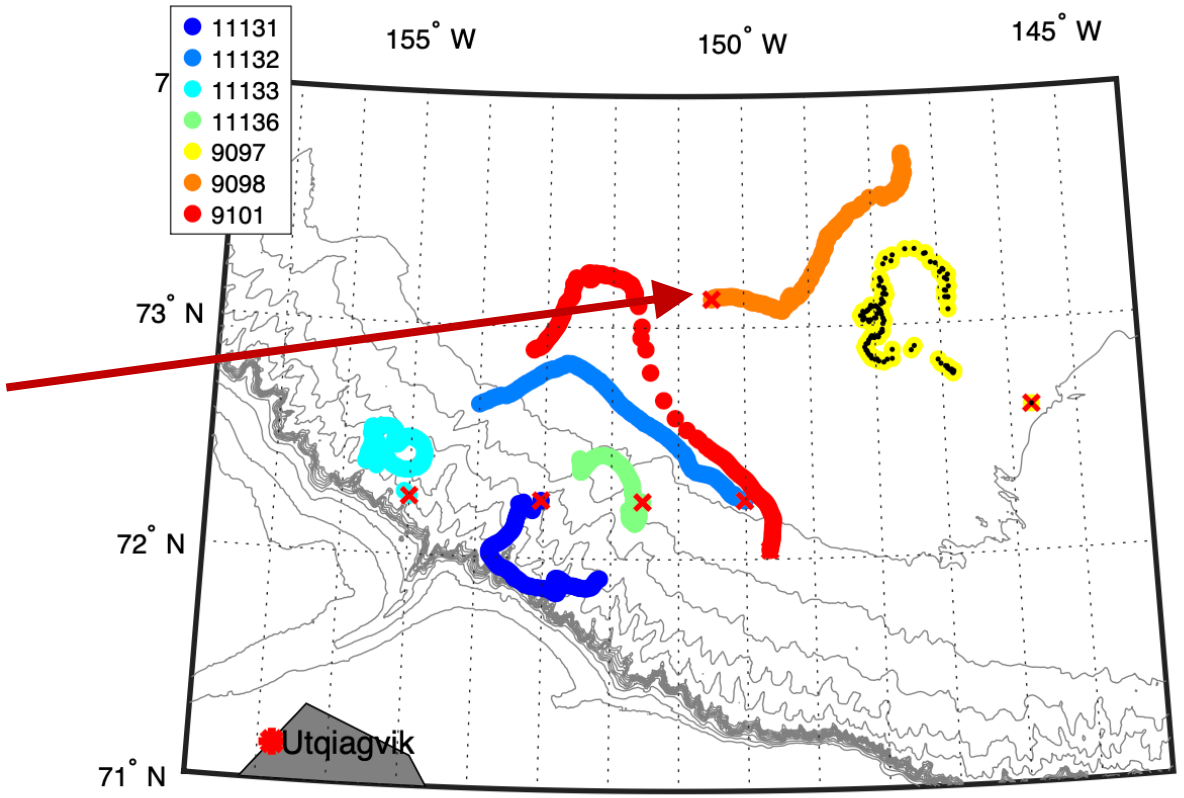
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