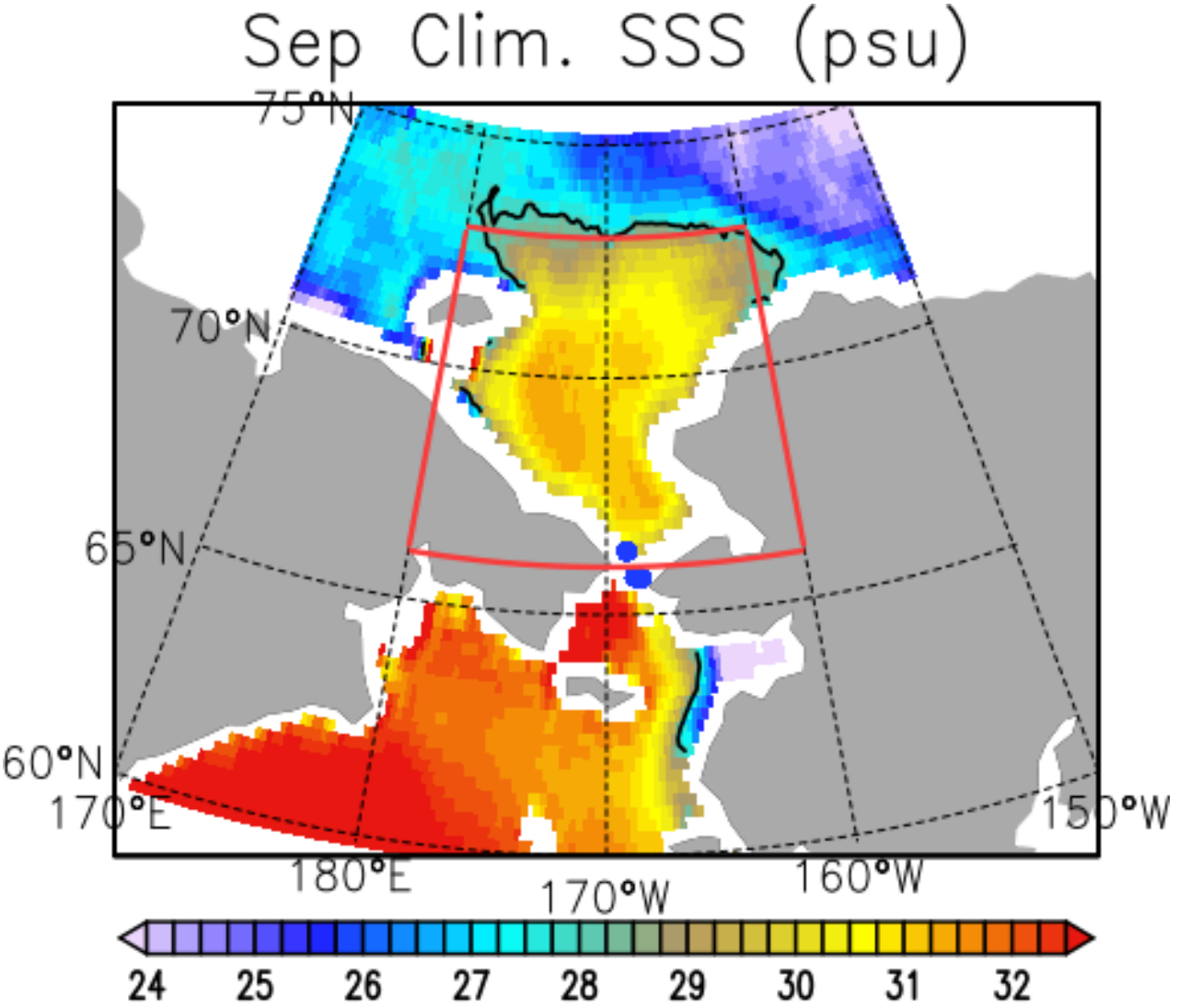


On the link between Chukchi Sea SSS and Bering Strait Inflow

Semyon Grodsky, University of Maryland

Supported by NASA/OSST

The Chukchi Sea is an Arctic open estuary with a mixed layer that is a few practical salinity units saltier than the surrounding open Arctic waters.

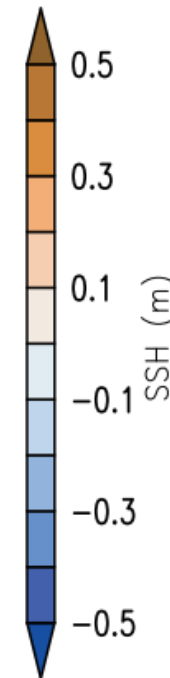
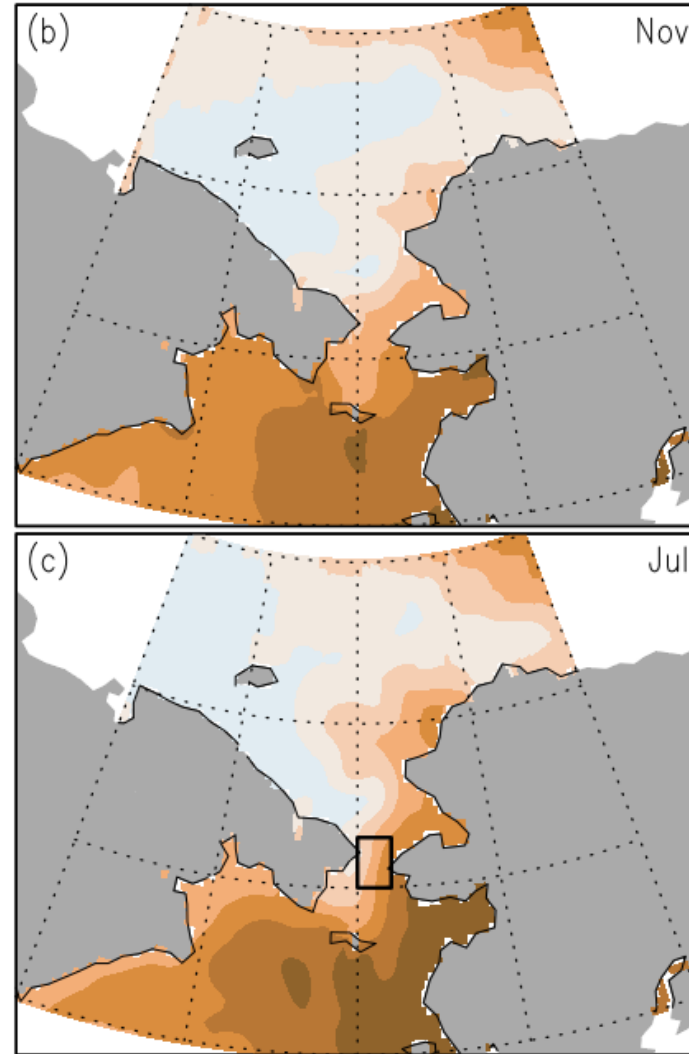
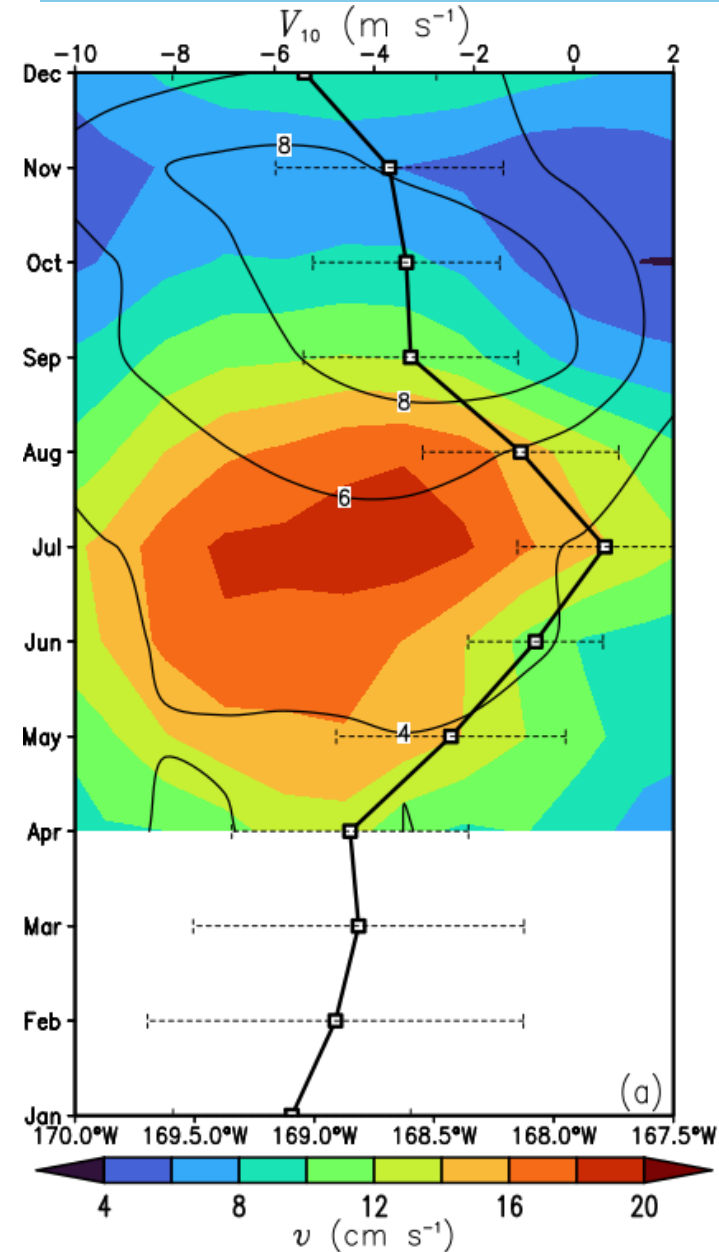


Climatological altimeter meridional geostrophic current across the Bering Strait

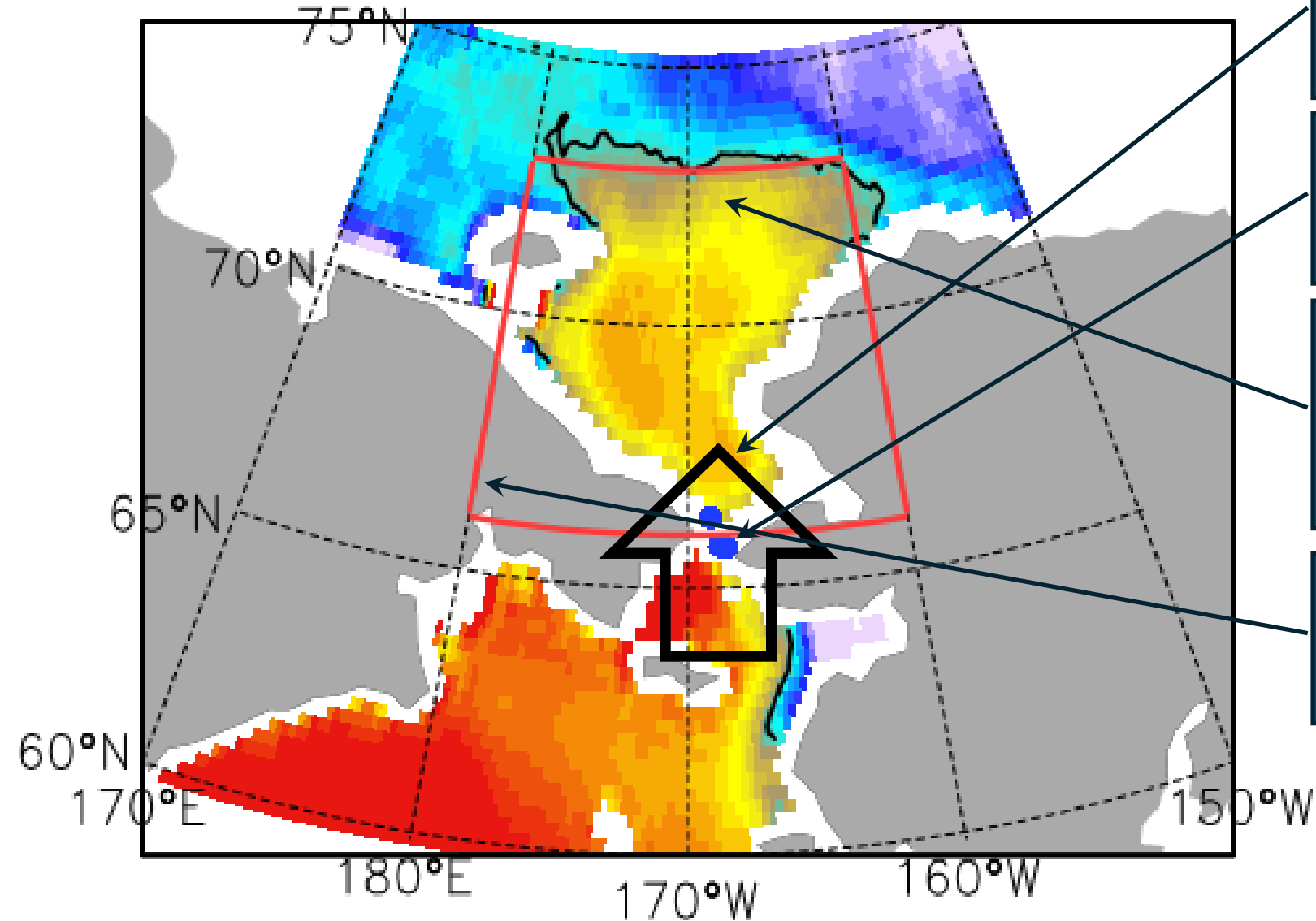
Climatological altimeter SSH in the Chukchi-Bering area

Salty regime in the Chukchi Sea is maintained by relatively warm, salty Pacific water inflow (~ 1 Sv) through the Bering Strait (**a**, shaded). It is driven by the annual sea level difference between the Chukchi and Bering Seas (pressure head; **b**, **c**).

Northward Bering Strait inflow peaks in the summer (**a**) due to the seasonal weakening of opposing northerly winds.



Sep Clim. SSS (psu)



During peak ice-free conditions in September, the inflow is northward

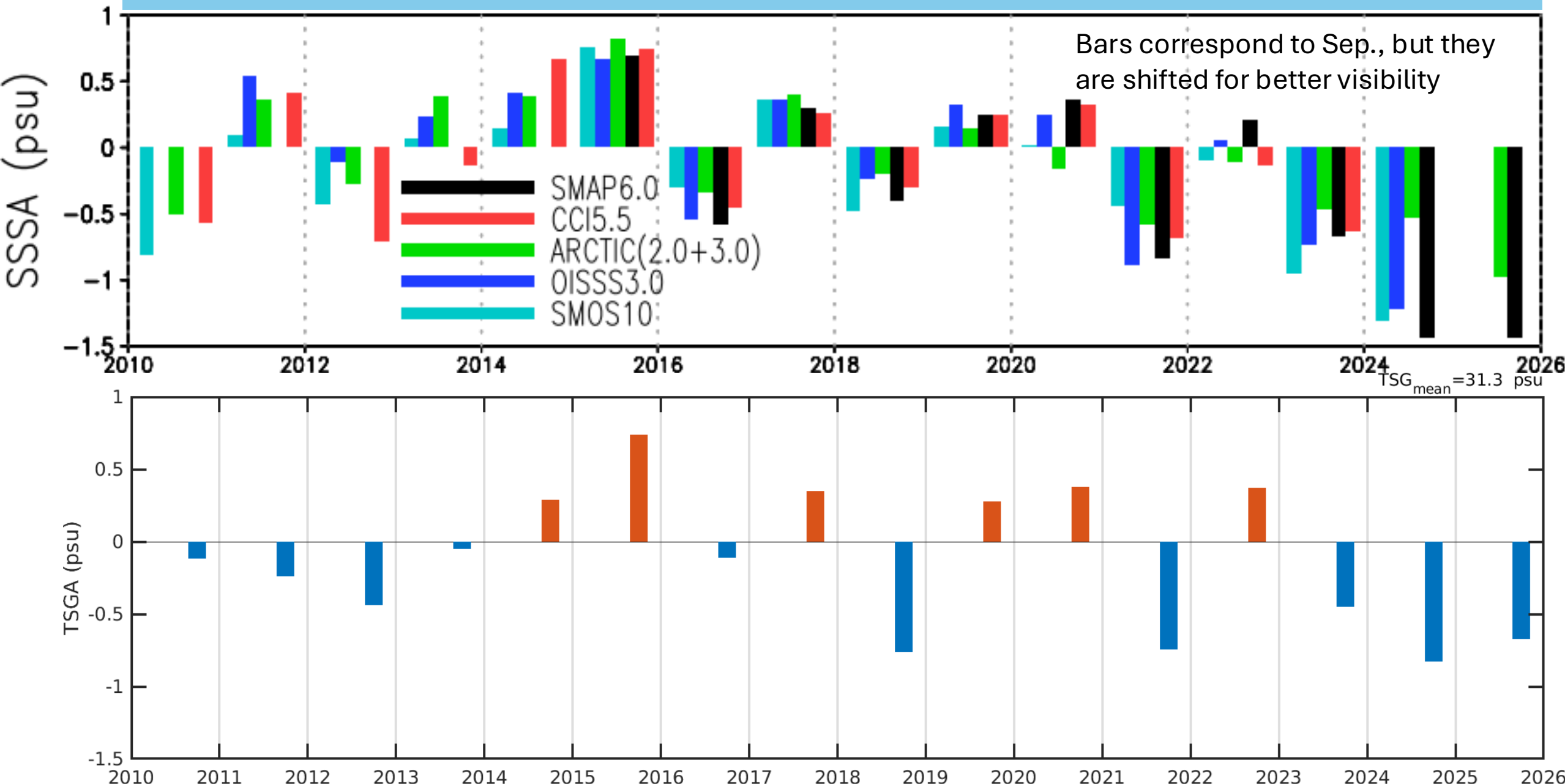
Bering Strait moorings (UW/APL) are a good proxy for the inflow salinity

Chukchi Sea salt pool is well-separated from ambient Arctic waters. The 28 psu threshold (black contour) is used

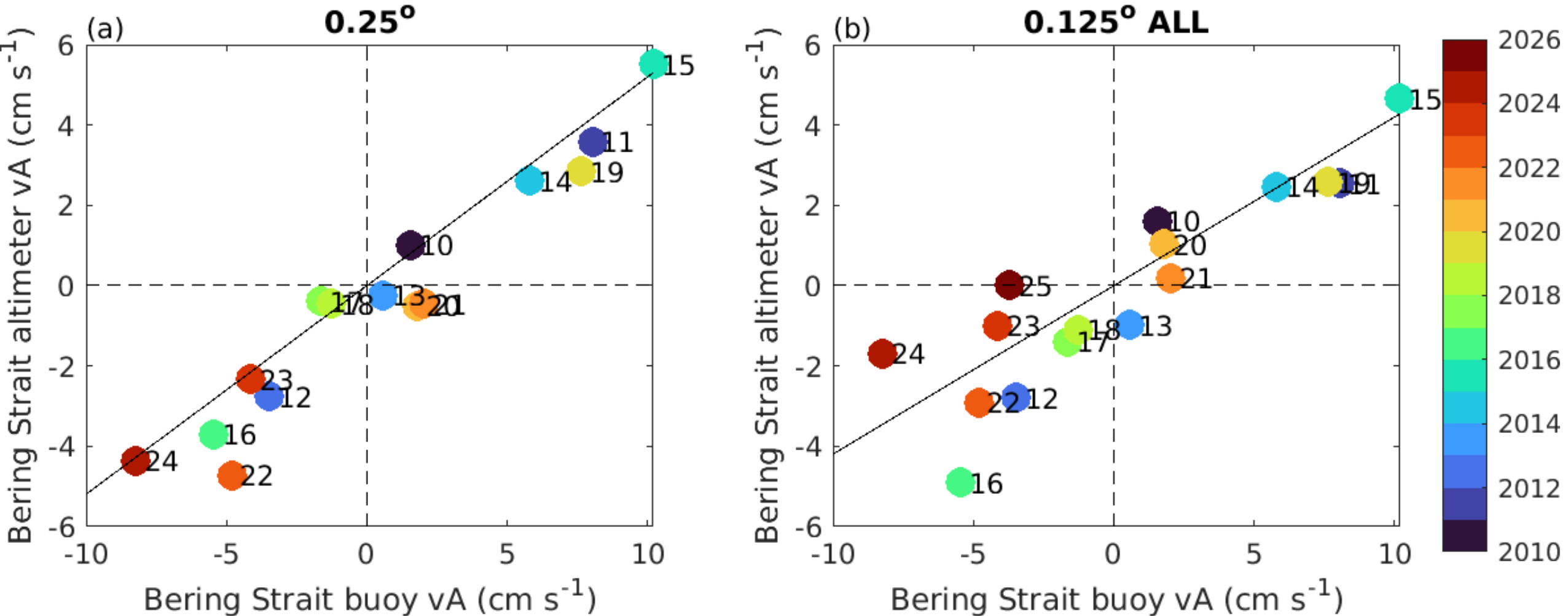
Next, we analyze variability of >28 psu water within the Chukchi Sea red box.



Chukchi Sea anomalous SSS in September from: (top) satellite products and (bottom) thermosalinograph meridional transects



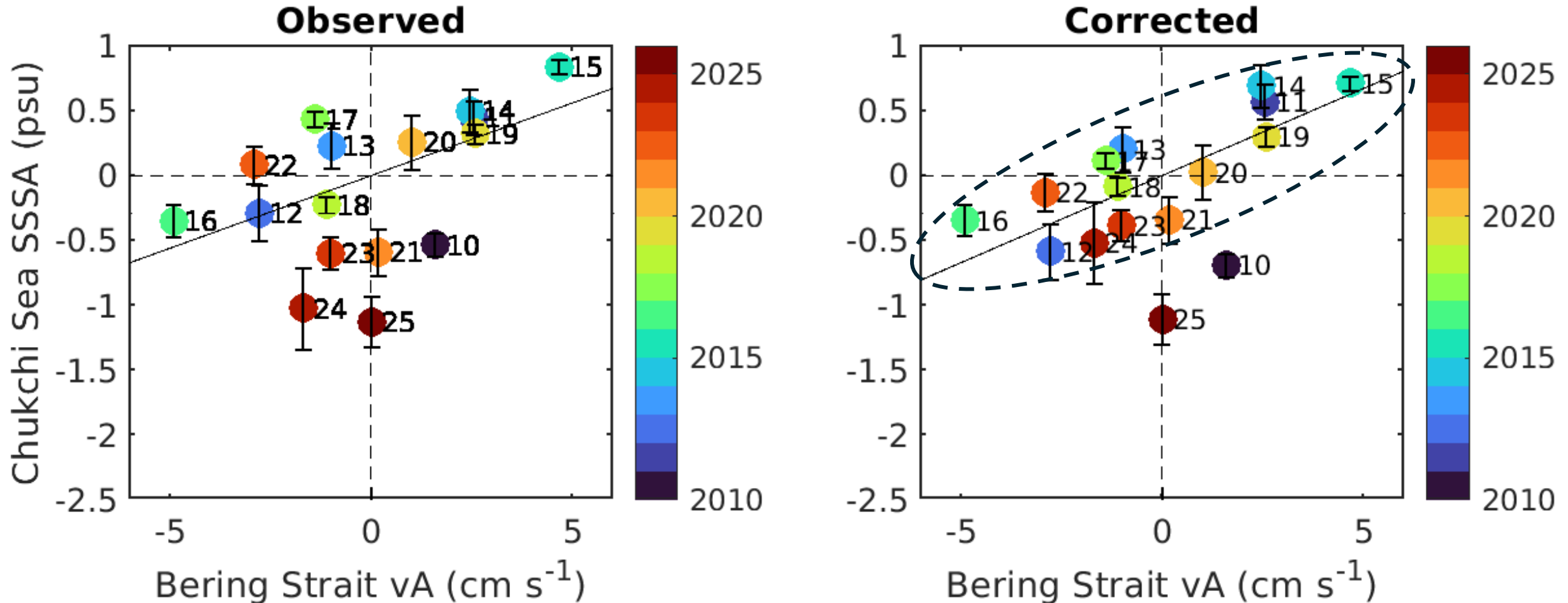
May-Aug. Bering Strait altimeter meridional geostrophic velocity anomaly from (a) old (0.25 deg) and (b) new (0.125 deg) AVISO all satellite products vs. depth-averaged meridional velocity anomaly from Bering Strait moorings.



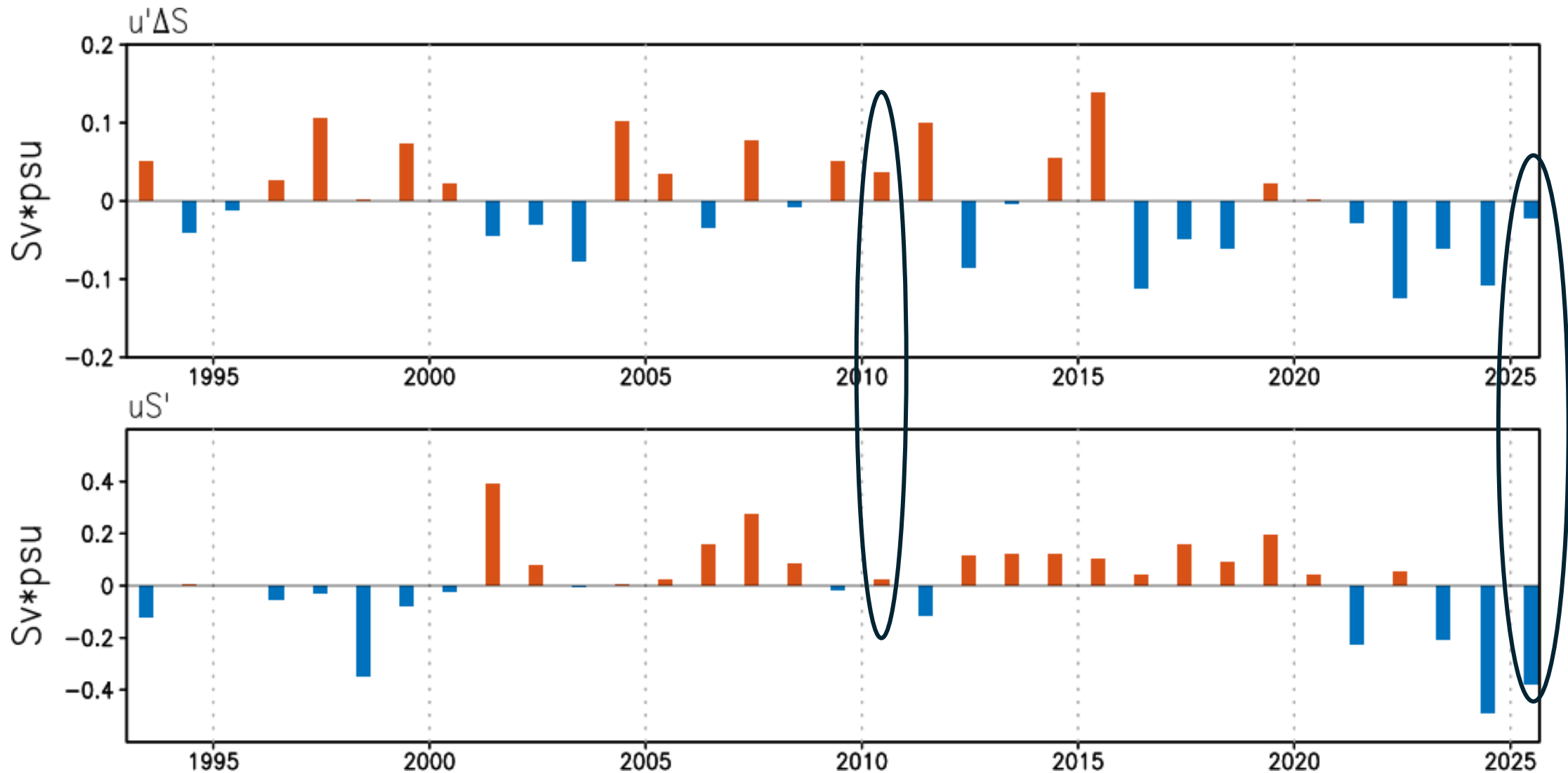
September Chukchi Sea area-averaged anomalous SSS (left) observed and (right) corrected for Bering Strait inflow salinity from moorings vs May-Aug. Bering Strait transport.

Bering Strait mass transport explains ~40% of Chukchi Sea SSSA variance

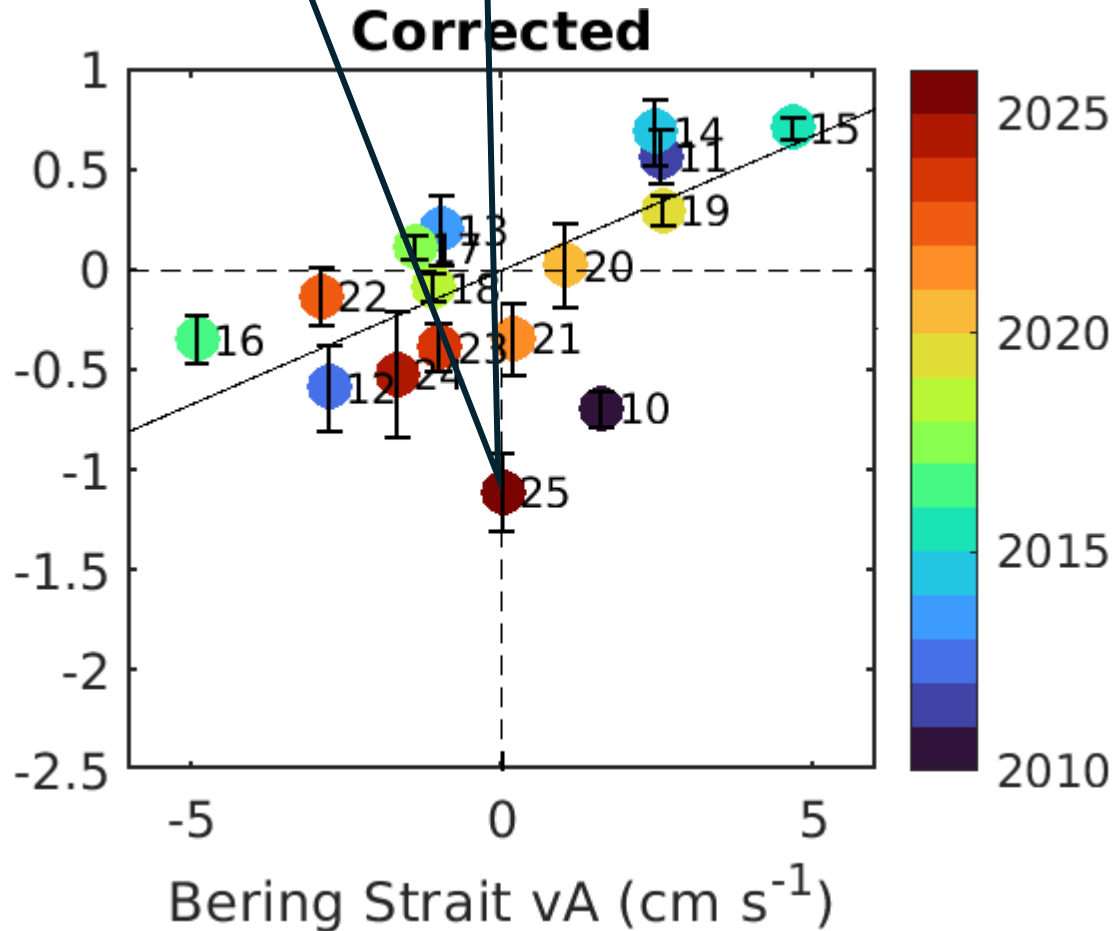
Bering Strait inflow salinity anomaly explains ~35%



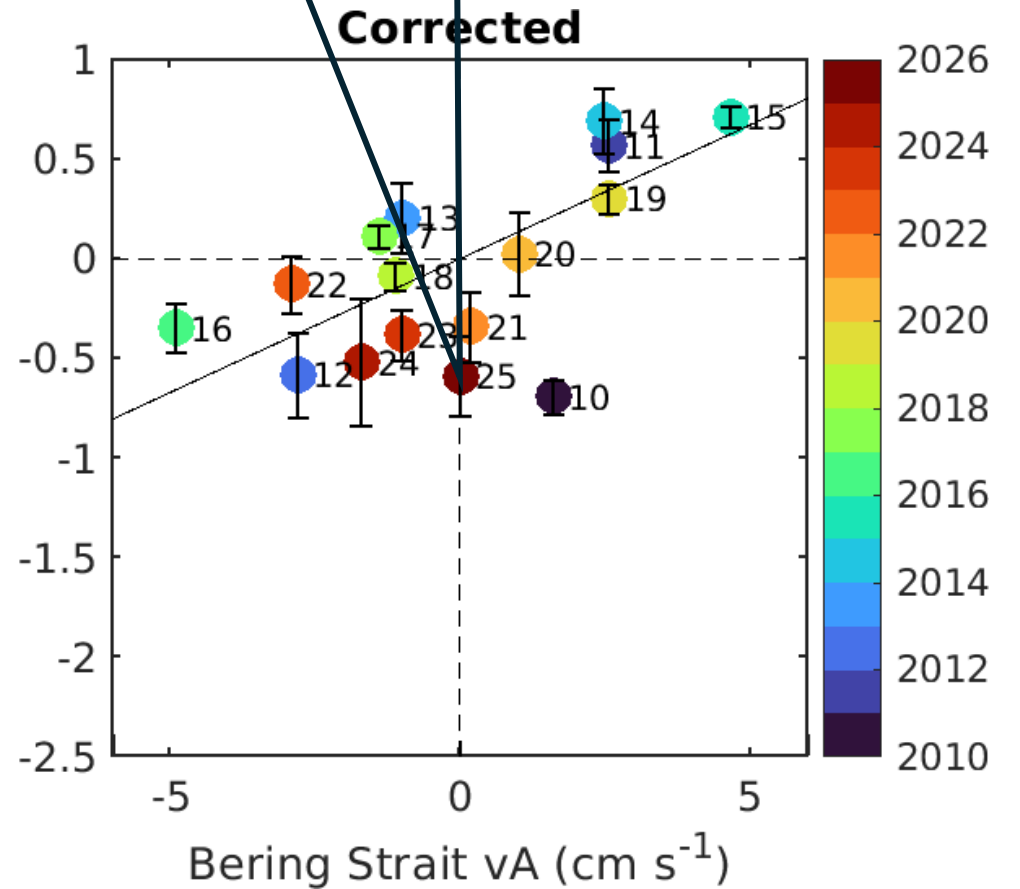
Bering Strait salinity transport anomaly components ($u'\Delta S$) and (uS') from GLORYS12V1 averaged May-Aug. each year



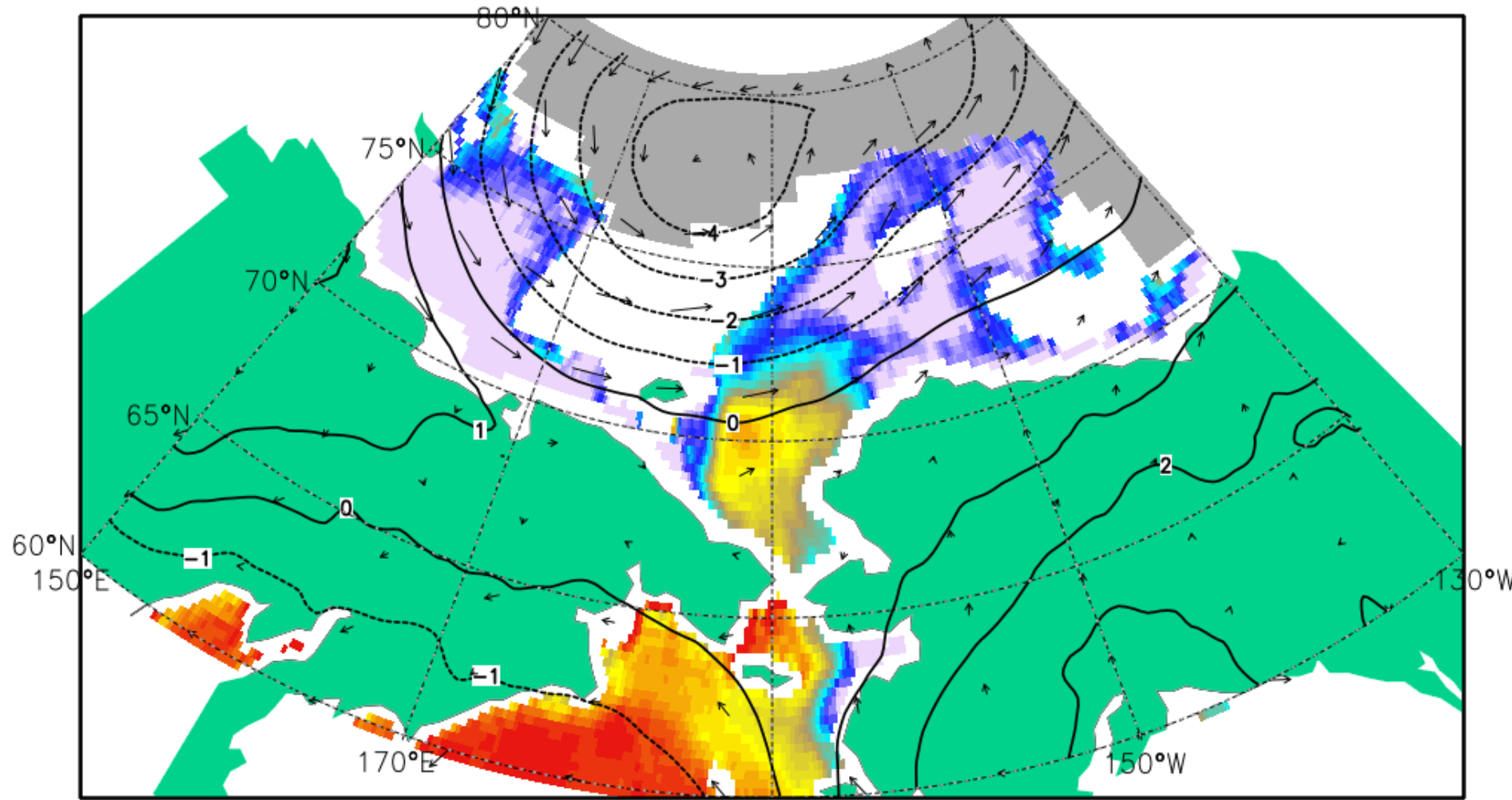
2025 salinity correction
from moorings (**May-Jun.**)



2025 salinity correction
from GLORYS (**May-Aug.**)



2025 Sep. SSS, preceding meto anomalies (Aug.), and Sep. clim. ice cover (>15%)



Contours - ERA5
MSLP anomaly
(mbar) in Aug.
2025

Arrows - 10m
wind anomaly in
Aug. 2025

Grey - Sep.
climatological
ice cover

Sep. 2025 SSS
from SMAP6.0



Summary

- Salty pool of the Chukchi Sea, formed by Pacific water inflow through the Bering Strait. In this study, it is distinguished from surrounding Arctic waters by salinity levels exceeding 28 psu.
- Both Bering Strait mass transport ($u'S$) and inflow salinity (uS') anomalies contribute. To characterize most ice-free SSSA in September, salinity transport anomalies are averaged from May to August, starting with annual re-stratification in May. Approximately **40%** of the September SSS anomaly variance in the Chukchi Sea is attributed to $u'S$, while uS' accounts for about **35%**. The salinity anomaly (S') is derived from Bering Strait mooring data.
- The strongest fresh outliers occurred in 2010 and 2025. The 2010 anomaly may reflect a global fresh bias in SMOS data at the start of the mission. In contrast, the 2025 anomaly remains less certain, likely influenced by incomplete mooring data (May–June only), a potential southward shift of the ice edge, and its associated ice melt.