Summer Chukchi Sea near-surface salinity variability in satellite observations and ocean models

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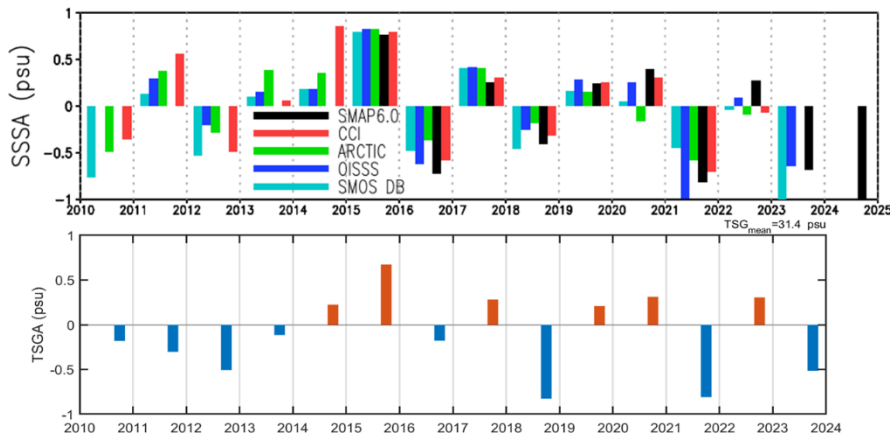
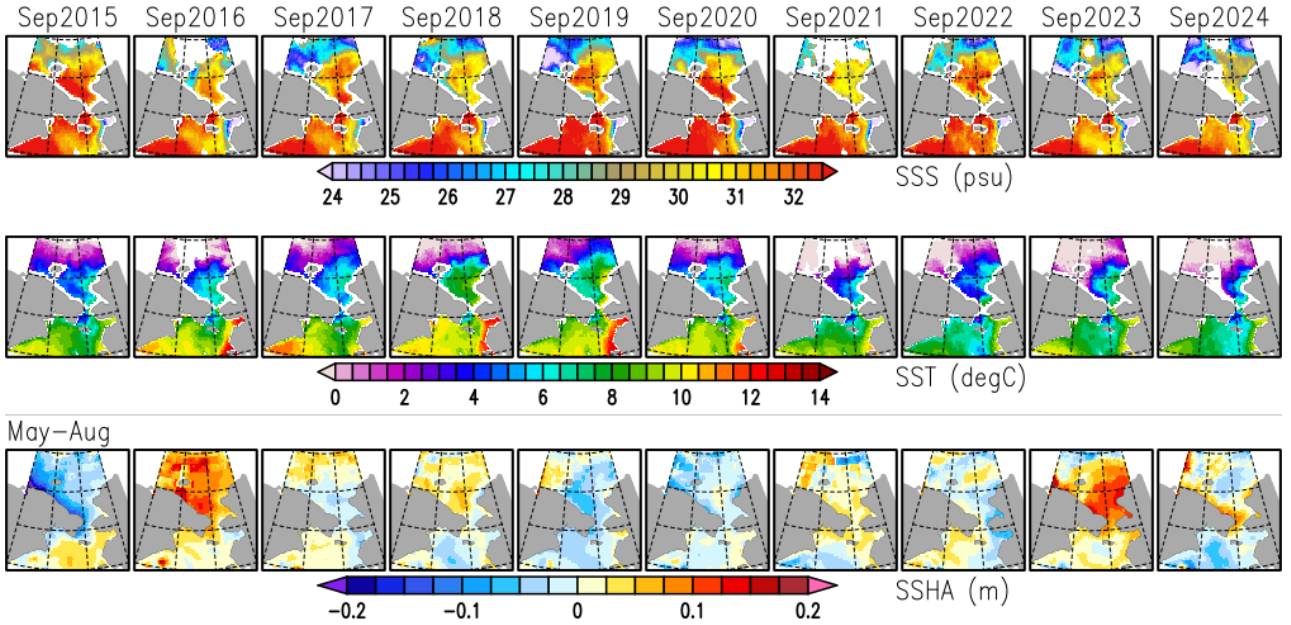
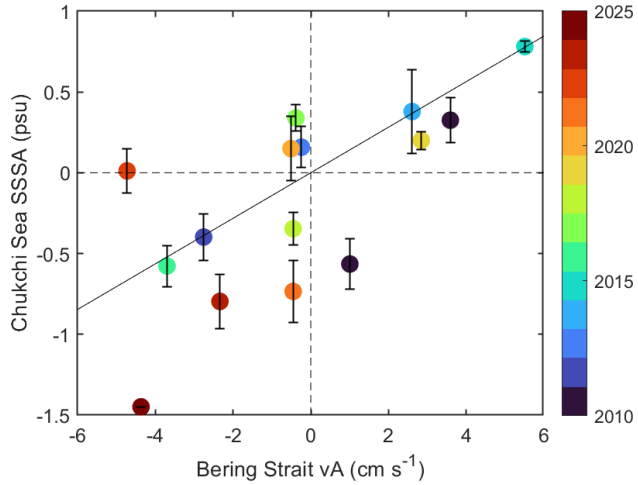
Abstract: The Chukchi Sea is an open estuary in the southwestern Arctic. Its SSS is higher than that of the surrounding open Arctic due to the inflow of saltier and warmer Pacific waters through the Bering Strait. This salinity distribution suggests that interannual changes in the Bering Strait transport reflect in the salinity distribution in the downstream Chukchi Sea. Using satellite SSS and altimetry-based Bering Strait transport, their relationship is analyzed from 2010 onward focusing on the ice-free summer to fall period. A comparison of five different satellite SSS products shows that anomalous SSS spatially averaged over the ice-free Chukchi Sea is consistent among them. Observed interannual change in satellite SSS is confirmed by comparison with collocated TSG. Bering Strait transport variability is known to be driven by the local meridional wind stress and by the Pacific-to-Arctic sea level gradient (pressure head). This pressure head, in turn, is related to an Arctic Oscillation-like atmospheric mean sea level pattern over the high latitude Arctic, which governs anomalous zonal winds over the Chukchi Sea and affects its sea level through Ekman dynamics. Satellite SSS anomalies averaged over the Chukchi Sea show a positive correlation with preceding months' Strait transport anomalies.



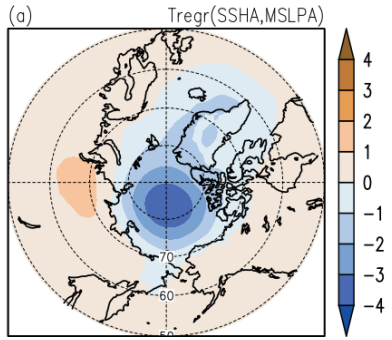
Sept.-Oct. SSS anomaly (SSSA) from **(a)** five satellite salinity products averaged over the Chukchi Sea box and **(b)** TSG transects averaged over (65.5N-70N,170W-167W). Bars in (a) are shifted to avoid overlapping.

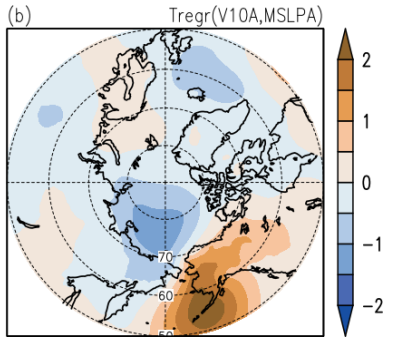


Sept. **(a)** SMAP v6.0 SSS, **(b)** SST from Canada Meteor-ological Center, **(c)** preceding May-Aug. de-trended multi-satellite sea level anomaly (SSHA)



Sept. Chukchi Sea SSSA versus May-Aug. Bering Strait geostrophic velocity anomaly (AVISO). Each symbol represents the mean of up to five SSS products while vertical bars represent their STD. Linear regression (solid), $SSSA = 0.11^{0.19}_{0.03} \cdot vA$, explains ~40% of SSSA variance, where subscripts are the 95% confidence interval of the regression coefficient





Time regression of May-Aug. anomalies of (**a**) Chukchi Sea SSHA, (**b**) Bering Strait northward wind ($V10A$) with atmospheric mean sea level pressure anomaly (MSLPA) elsewhere

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