

## Anomalous Fresh Chukchi Sea Surface Salinity in Summer-Autumn 2021

The Chukchi Sea is a marginal sea in the Arctic with a mixed layer that is a few psu saltier than surrounding water due to the warm, salty Pacific water that enters through the Bering Strait (Fig. 1a). Hence, changes in its inflow characteristics should have an impact on the Chukchi Sea's thermohaline characteristics. Recently, two additional controlling factors have been highlighted - the strength of boundary currents along the Siberian coast, and meridional exchanges due to wind-driven transport.

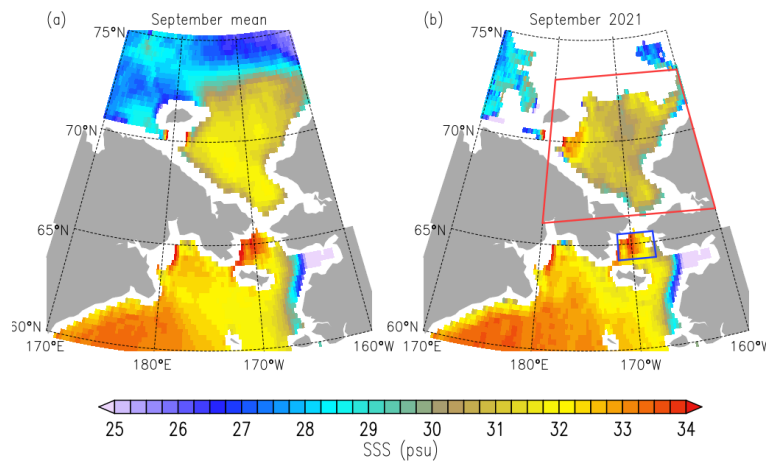
It is illustrated that anomalous fresh Chukchi Sea SSS in summer-autumn 2021 (Fig. 1b) are related to influences from the north via the anomalous southward shift of the ice edge and its meltwater source (Fig. 2). These anomalous ice conditions occur concurrently with anomalously low atmospheric pressure in the Beaufort High, anomalous westerly cyclonic winds over the ice-covered and open water Chukchi Sea, and related southward Ekman transport of late season meltwater. The September 2021 ice expansion was the largest in 1981-2021 detrended ice records (Fig. 3). The regional southward ice coverage shift observed in September 2021 may have been caused by anomalous cyclonic winds caused by an abnormally low Beaufort High.

A comparison of TSG salinity and collocated SMAP SSS reveals that regional satellite SSS data have salty biases of up to a few psu (Fig. 2c). However, the interannual variability in anomalous, rather than absolute, SSS is consistent with TSG, with SSS in 2021 being approximately 1 psu fresher than in 2019.

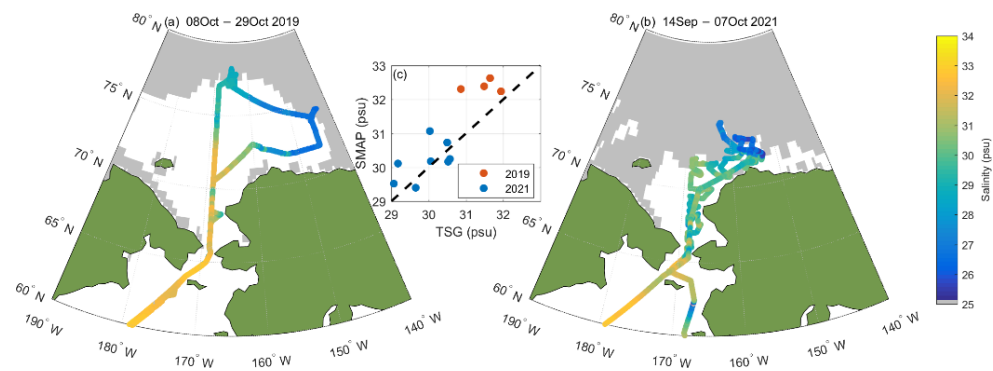
Given the magnitude of ice coverage and SSS anomalies observed in summer-autumn 2021, further investigation of the 2021 fresh Chukchi Sea event is warranted.

Grotsky, S. A., Reul, N., Bentamy, A., & Vandemark, D. (2023). Anomalous fresh Chukchi Sea surface salinity in summer-autumn 2021. *Remote Sensing Letters*, 14(2), 135–147.

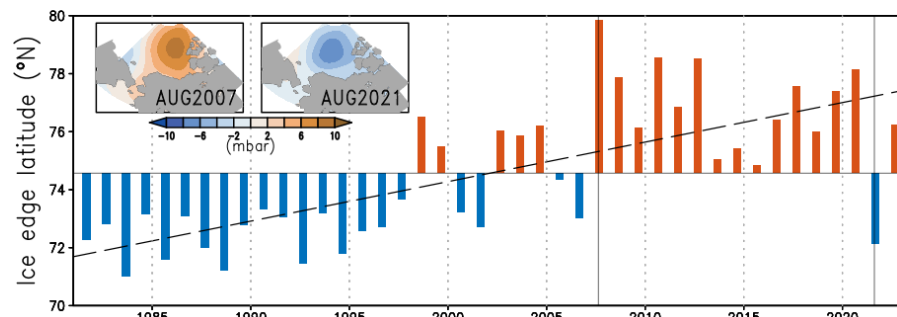
<https://doi.org/10.1080/2150704X.2022.2164231>



**Figure 1.** SMAP V5.0 September SSS (a) mean and (b) 2021.



**Figure 2.** TSG transects (R/V MIRAI) in fall of (a) 2019 and (b) 2021. Gray shading is (a) Oct. 2019 and (b) Sept. 2021 ice cover. (c) Daily mean TSG and collocated SMAP SSS from Chukchi Sea between 65 and 70N.



**Figure 3.** September ice edge latitude averaged 185 -195E. Inlay shows Aug. 2007 and 2021 Beaufort High MSLP anomaly for the strongest northward and southward detrended sea ice edge shift.