

Sea surface salinity response to variations in the Aleutian Low

Semyon A. Grodsky, Nicolas Reul, and Douglas Vandemark

Aleutian Low pressure atmospheric system varies interannually, with distinct impacts on SST, sea level, and other parameters along the North Pacific subarctic front. These impacts are caused by variable zonal winds through their effects on meridional Ekman transport and air-sea fluxes. While the SST response is well known on an interannual (ENSO) to decadal (PDO) scales, the response of SSS is less known due to relatively sparse observations. As demonstrated by satellite SSS, Argo salinity data, and model simulations, the SSS response originates in the western Pacific and is concentrated along the subarctic front, reaching a few tenths of psu in the upper 100 m. SSS anomalies, in contrast to SST anomalies, behave like passive tracers that are advected eastward in the North Pacific Current across the entire basin and, unexpectedly, sometimes intensify to the east. After reaching the eastern boundary, they continue predominantly southward along the California coast, remaining detectable by satellite SSS all the way to the southern tip of the California peninsula.

Figure 1. Annual anomalies of satellite SSS (OISSS), SST, and winter (Nov.-Mar.) anomaly MSLP during satellite SSS period 2011-onward. SSS and SST anomalies are averaged over a calendar year, winter MSLP anomalies are averaged over five months from the previous year Nov. to the current year Mar. The three largest Aleutian Low positive (A, C) and negative (B) MSLP anomalies correspond to salty and fresh SSS anomalies in the western north Pacific, respectively. These salinity anomalies are advected eastward across the entire North Pacific and then southward along the California coast (dashed lines in the left column). The core of winter climatological Aleutian Low (<1003 mbar) is cross-hatched

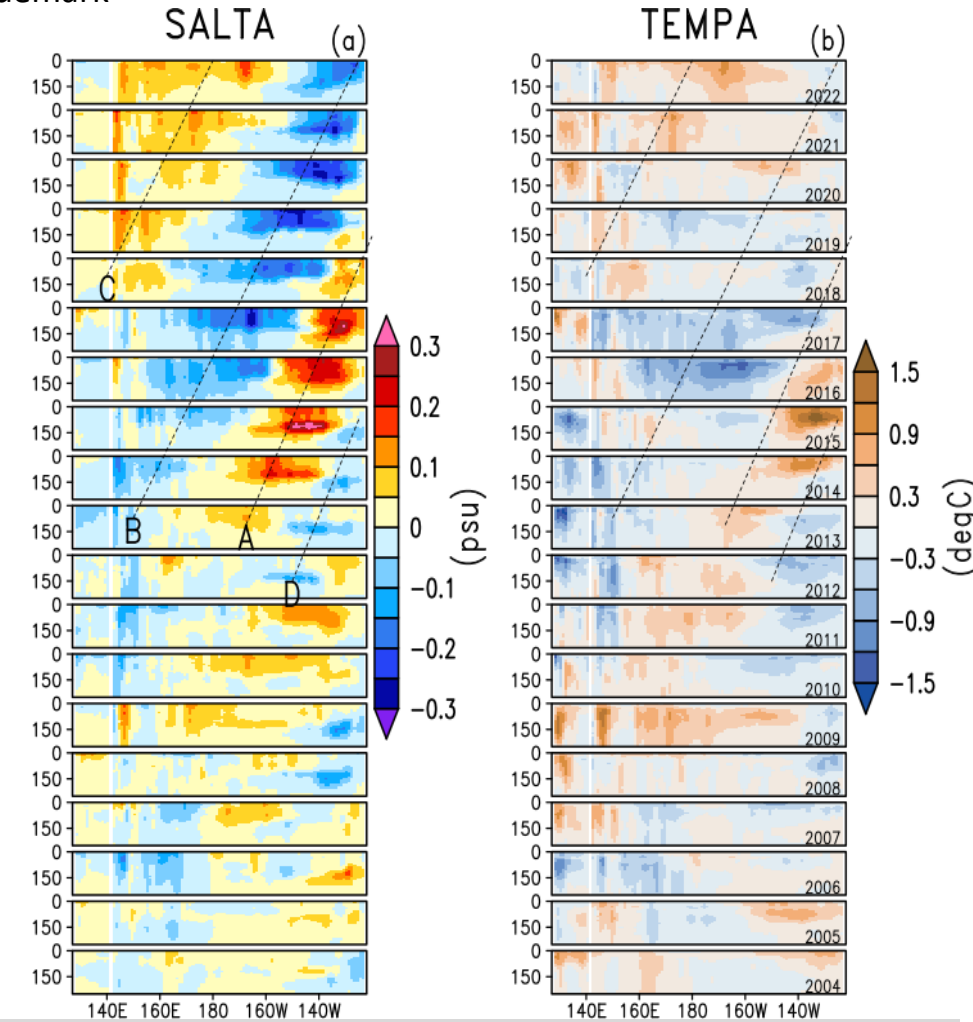
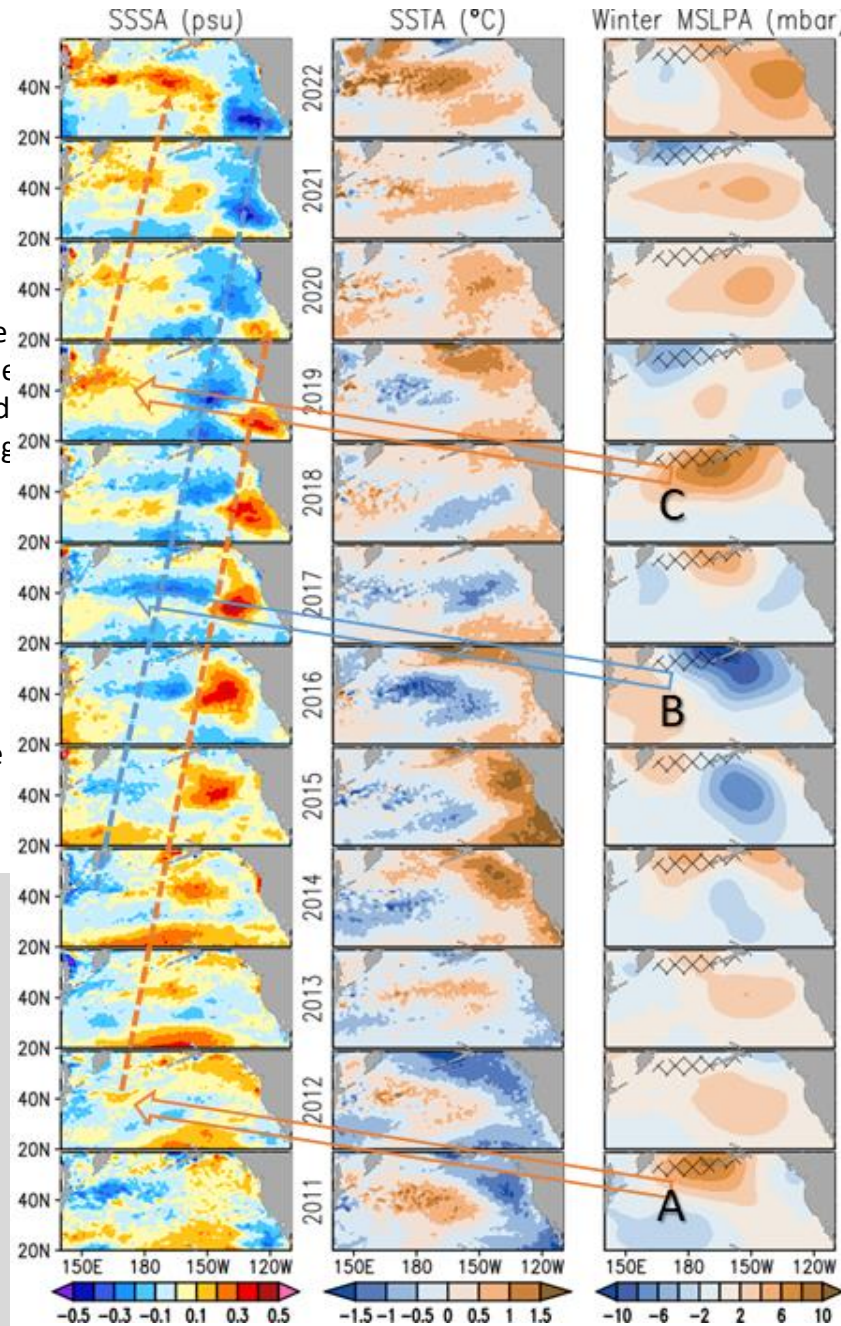


Figure 2. Annual depth-longitude (a) salinity, SALTA, and (b) detrended temperature, TEMPA, anomalies averaged 38°-46°N along the subarctic front. Slope dashed lines ($\sim 3 \text{ cm s}^{-1}$) follow eastward salinity features (A, B, and C) discussed in Fig.1 based on satellite SSS data. Subsurface fresh salinity anomaly (D) is outlined. Data are from the SIO Argo analysis. The same slope lines are shown in panels (a) and (b).