## Genesis of Spiciness Anomaly in the Northeast Pacific

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Spiciness anomaly is defined as salinity anomaly on certain isopycnal layer. Based on Argo observations, the most significant spiciness anomaly variations in the upper North Pacific are seen in the Northeast Pacific (145°-125°W, 25°-36°N; the study region) within  $\sigma \theta = 25.0 - 25.4 \text{ kg m}^{-3}$  isopycnal layer (the study isopycnal layer). The study region sits exactly at the formation region of the North Pacific Eastern Subtropical Mode Water (NPESTMW). Besides, the region is located at the subpolar front, with cold and fresh water mass in the northeast, and warm and salty water mass in the southwest. This leads a density-compensating feature of NPESTMW, which favours spiciness anomaly process. The genesis of spiciness anomaly on the study isopycnal layer is controlled by subduction of NPESTMW and spiciness anomaly injection processes during late winter. The spiciness anomaly on the ligher  $\sigma \theta = 25.0 - 25.2 \text{ kg m}^{-3}$  isopycnal layer is decided by the subducted NPESTMW. The denser  $\sigma \theta = 25.2 - 25.4 \text{ kg m}^{-3}$  isopycnal layer does not ventilate. The positive spiciness anomaly on this particular layer is caused by diapycnal mixing across the subduced isopycnal (i.e. spiciness anomaly injection), while the negative spiciness anomaly is driven by southward advection of subpolar water.

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