Subduction of temperature anomalies of the 2013-2015 North Eastern Pacific warm “blob”

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Northeastern Pacific sea surface temperature (SST) off the west coast of North America has been extremely warm since late 2013, a record SST warming sometimes called “blob”. This study investigates subsurface oceanic changes associated with the blob using a gridded objective analysis dataset based on Argo profiling floats (MOAA-GPV) for the period 2005-2015. The MOAA-GPV data show that the warming is not confined at the surface mixed layer (ML) but penetrates into thermocline around the depth of 100-200m since the development of the blob. Decomposition of the temperature anomalies into parts associated with density anomalies and parts that are density-compensated with salinity reveals that the subsurface penetration of the temperature anomalies into the thermocline takes pace in the form of density-compensated anomalies (a.k.a. spiciness) while the density-associated anomalies are only confined in the ML. A possible explanation of this subsurface spiciness generation is a previously proposed mechanism where a temperature anomaly at the surface shifts isopycnal outcrops across mean temperature and salinity gradients and thereby alters the temperature-salinity properties on isopycnal surfaces. We will discuss how this local spiciness generation process as well as large-scale spiciness advection in the thermocline contribute to the subsurface heat penetration beneath the blob. Even after the surface blob decays, it is likely going to leave a longer-lived signature in the subsurface thermocline.

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