

Ocean mixed layer heat budget east of Japan

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We investigate the Ocean Mixed Layer (OML) heat budget close to the North Pacific Subarctic Front in an area where the front is quasi-stationary (155° E). This area is of particular interest because strong air-sea heat exchanges there may affect storm tracks. Also, it is thought to be a formation area of central mode water. The heat budget is computed using satellite SST (AMSRE), altimetry (AVISO) and surface wind data (QuikSCAT). Argo profiling float temperature and salinity data are used to estimate the depth of the mixed layer.

The heat budget seasonal cycle is investigated in two boxes representative of two different regimes of the budget: a deep mixed layer box south of the front where the winter mixed layer depth reaches up to 300 m, and a shallow mixed layer box where winter mixed layer reaches 125 m. In the deep OML box, strong winter cooling mostly due to heat loss to the atmosphere is amplified by Ekman advection and entrainment from below the mixed layer (contributing 30 percent of the cooling). In the shallow OML box, strong cooling by Ekman advection is largely balanced by geostrophic advection due to the front. The effect of this balance on the winter OML water properties linked to Transition Region Mode Water formation are subsequently investigated.

Keywords: North Pacific Subarctic Front, ocean mixed layer, heat budget, observation data, mode water