

Impacts of 2009 typhoons on seawater properties and top layer ocean's structure in the Northwest Pacific Ocean

ABSTRACT

Passing over the ocean surface, typhoon absorbs heat from the sea water as it needs the heat as its 'fuel'. The process is via evaporation of water. Subsequently, the sea surface temperature (SST) in that area will significantly decrease. Due to strong typhoon wind water is evaporated from the surface layer of the ocean, the amount of water mass in that area is lost, but the same amount of salt will remain, causing sea surface salinity (SSS) to increase. Strong winds induced by typhoons will also cause turbulence in the water, causing entrainment, where cold deeper water is brought up to the surface layer of the ocean, which will consequently increase its SSS and change the isothermal layer and mixed layer depth (MLD). Here, isothermal layer means the ocean layer where temperature is almost constant and MLD is the depth where salinity is almost constant. This paper focuses on the effect of typhoons on SST, SSS, isothermal layer and MLD by taking 15 typhoons in the Northwest Pacific throughout 2009 typhoon season (typhoons Lupit and Ketsana are used as examples in results) into consideration. Temperature and salinity data from selected Array of Regional Geostrophic Oceanography (ARGO) floats close to the individual typhoon's track are used in this study. The results showed that SST decreased up to 2.97°C; SSS increased up to 0.44 pss and majority of the typhoons showed deepening of isothermal layer (between 39.8 m and 4.6 m) and MLD (between 69.6 and 4.6 m) after the passage of typhoons. Passing of each individual typhoon also removed significant amount of heat energy from the affected area. The highest amount of heat of 841 MJ m⁻² to the lowest of 30 MJ m⁻² was calculated during the study period. For comparison purpose, an equivalent amount of electrical energy in kWh is also calculated using the amount of heat removed by the typhoons.