

Revisit of typhoon's effect on biogeochemistry in the western Pacific subtropical-oligotrophic region

*Makio Honda¹, Yutaka Yoshikawa²

1. Japan Agency for Marine-Earth Science and Technology, 2. Kyoto University

Comparative study for biogeochemistry between the western North Pacific subarctic eutrophic region (SAER) and subtropical oligotrophic region (STOR) (K2S1 project, Honda et al. JO 2017) revealed that primary productivity in STOR is comparable to or higher than that in SAER. In their study, it was proposed that mesoscale cyclonic eddies contribute to nutrient supply to support primary productivity. On the other hand, it was evaluated that, based on the observation and vertical one-dimensional model (1D model), typhoon passing over the buoy site (KEO) plays minor role in the nutrient supply. However, many previous studies have reported typhoons effects on biogeochemical environments through intense turbulent mixing and upwelling. In addition, it was criticized that the numerical simulation by using the 1D model is less precise in evaluating the typhoon's effect. Thus, we initiated the revisit of typhoon's effect on the physical and biogeochemical environments using three-dimensional model (3D model). As preliminary experiment, we performed experiments with axis-symmetric wind stress of virtual typhoon with parameters (e.g., radius and transition speed) similar to observed ones in the STOR, and compared the typhoon effects simulated in the 1D and the 3D models. It was found that, after the virtual typhoon passed, the Ekman upwelling and the near inertial internal wave as observed at the ocean buoy in 2014 at subtropical time-series station KEO appeared in 3D model simulation. It was also found that, in addition to the 1D effect (wind-induced turbulent mixing effect), these 3D effects make the simulated nutrient (N) supply to upper 50 m larger. In future, numerical simulation with actual parameters of observed typhoon data and the associated meteorological / physical oceanographic / chemical oceanographic data will be conducted in order to evaluate typhoon effect on biogeochemistry. In addition, variable case studies will be conducted and it will be discussed what kind of typhoon impact on the subtropical-oligotrophic biogeochemistry significantly.

Keywords: typhoon, subtropical-oligotrophic region, biogeochemistry, 3 dimensional model simulation, Ekman upwelling, near inertial internal wave