Missing source of nutrients -Mechanism of nutrients' supply in the oligotrophic region -

*Makio Honda[1], Eko Siswanto[1], Kazuhiko Matsumoto[1], Eitarou Oka[2], Meghan Cronin[3]

1.Japan Agency for Marine-Earth Science and Technology, 2.The University of Tokyo, 3.National Ocean and Atmosphere Administration

It is well known that the northwestern Pacific subtropical region is oligotrophic: its nutrient in upper sun-lit layer of this region is very low or deficient all the year around. However it is recently reported that its primary productivity is comparable to or larger than that in the northwestern Pacific subarctic eutrophic region. In order to verify the mechanism of nutrients supply to the oligotrophic upper layer, time-series sediment trap was deployed at 5000 m near National Ocean and Atmospheric Administration (NOAA) time-series station KEO, where meteorological and physical oceanographic observation has been conducted with surface buoy (NOAA-KEO buoy), and temporal variability in settling particles deeply associate with surface primary productivity was observed between July 2014 and July 2015. Total mass flux clearly increased three times: (1) first half of October 2014, (2) first half of January 2015, (3) last half of April 2015. In September 2014, two typhoons passed near station KEO. Based on analysis of satellite data, it was verified that SST decreased and chlorophyll-a increased after typhoons along typhoons' tracks. This was supported by temporal variability in vertical profile of water temperature upper 500 m observed by NOAA-KEO buoy: during typhoon passage, a few days' scale upwelling of subsurface cold water occurred. On the other hand, time-series observation of vertical profile of water temperature revealed that a month's scale upwelling also occurred in July and November 2014. It is suspected that these upwelling were attributed to pass of meso-scale eddy near station KEO. In addition, winter upwelling (winter cooling mixing) was also observed, centering February and March 2015. Taking into account for the time lag, temporal variability in upwelling and total mass flux was generally synchronized. Thus upwelling caused by meteorological disturbance and meso-scale eddy likely supplied nutrients to upper sun-lit layer resulting increase of primary productivity and sequentially increase in settling particles. In future, by simultaneous time-series observation of meteorology, physical oceanography and biogeochemistry, mechanism of nutrients' supply to oligotrophic region (not only upwelling, but also eolian input) will be quantified.

Keywords: Oligotrophic region, primary productivity, nutrients, meso-scale eddy, meteorological disturbance, Time-series observation

