Variations of surface ocean pCO_2 and air-sea CO_2 fluxes in the Western Pacific Ocean

*Wataru Konarita[1], Shinji Morimoto[1], Shuji Aoki[1]

1. Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University

Temporal and spatial variations of CO_2 partial pressure in surface sea water ($pCO_{2,sea}$) observed in the western Pacific were analyzed in terms of physics and chemistry of the ocean and the CO_2 fluxes between the atmosphere and ocean were also evaluatedand the CO_2 flux between the atmosphere and ocean . The $pCO_{2,sea}$ has been observed continuously on-board a cargo ship “Trans Future 5” on her round-trip between Japan and Australia. Systematic observations for the atmospheric pCO_2 ($pCO_{2,air}$) were have been also conducted in the western Pacific by a grab-sampling method using container ships sailing almost similar route.

In the equatorial region, interannual variabilities of $pCO_{2,sea}$ were clearly observed, and were highly correlated with the El Niño Southern Ocsillation (ENSO). Higher $pCO_{2,sea}$ observed in 2008 and 2012, coincident with La Nina, could be caused by transport of high salinity, low temperature and high dissolved inorganic carbon water upwelled off the coast of Peru to the observation line at the western Pacific Ocean. When large and strong El Nino occurred from 2015 to 2016, significant increase of $pCO_{2,sea}$ was observed between 25˚N and 25˚S. The $pCO_{2,sea}$ increase could be associated with remarkable decrease of the precipitation observed in the western Pacific region.

The CO_2 flux between the atmosphere and the ocean was calculated by using the air-sea pCO_2 difference in pCO_2 ($DpCO_2$) between the atmosphere and the surface ocean, sea surface temperature and wind speed at 10m height. In the western Pacific Ocean, the largest CO_2 absorption was found at 20˚S (−13.0 gC m^{-2} yr^{-1}), and the net CO_2 outgassing at equatorial area (1.2 gC m^{-2} yr^{-1}) were found.

The increase in $pCO_{2,sea}$ associated with the strong El Niño event in 2015 and 2016 may have caused a decrease in the oceanic CO_2 absorption throughout the western Pacific.

Keywords: co2 partial pressure, Pacific, ENSO

