Relationship between oceanic and atmospheric variations in the Philippine Sea and modulation of El Nino events

*Takuya Hasegawa[1], Akira Nagano[2], Iwao Ueki[2], Kentaro Ando[2]

1. Tohoku University, 2. JAMSTEC

Western Pacific Oscillator model (WPO model), which is the one of the ENSO theory models, shows strong anti-cyclonic anomalies over the wetern tropical Pacific (around Philippine Sea) after a mature phase of El Nino. To check this point, time series of sea level pressure (SLP) anomalies averaged over the Philippine Sea for boreal-winter (i.e., January to March) is made. The result shows that eastern-Pacific (EP)-El Nino events (1982.83, 1986/87, 1991/92, 1997/98) show strong positive SLP anomalies in line with the WPO model. On the other hand, central-Pacific (CP)-El Nino events (1994/95, 2002/03, 2004/05, 2006/07, 2009/10) show weak SLP anomalies. Next, composite maps for SLP and sea surface winds during boreal-winter in the year of occurrence of EP-El Nino and CP-El Nino are made, respectively. It is shown that positive SLP anomalies and related anti-cyclonic sea surface wind pattern appear over the Philippine Sea for EP-El Nino. In the south part of the Philippine Sea, easterly anomaly winds appear and it can lead poleward Ekman transport that decreases warm water volume in the western equatorial Pacific. This situation is consistent with that expected from the WPO model, that is, the equatorial cold Kelvin waves can be generated, and then will terminate the on-going El Nino event to start the next La Nina event. Analysis on the sea surface height anomalies also shows negative sea surface height anomalies in the western equatorial Pacific at that time. In contrast to the EP-El Nino, CP-El Nino does not show such patterns of SLP, sea surface wind, and sea surface height anomalies. Therefore, it can be said that WPO model does not well act after mature phase of CP-El Nino, while the model does well after mature phase of EP-El Nino.

Acknowledgment: This work was partly supported by the Japan Society for the Promotion of Science (JSPS), Grant-in-Aid for Scientific Research (17K05660).

Keywords: El Nino, Philippine Sea, western Pacific Oscillator model

