Mechanisms of Reemergence in the North Pacific revealed by Mixed Layer Heat Budget Analysis

*Kazumichi Murata[1], Shoichiro Kido[1], Tomoki Tozuka[1]

1. Department of Earth and Planetary Science, School of Science, The University of Tokyo

Wintertime sea surface temperature (SST) anomalies that disappear in summer and recur in the following winter is called “reemergence”. Previous studies suggested that temperature anomalies that subduct into the subsurface during the shoaling phase of the mixed layer are preserved under the mixed layer due to isolation from atmospheric forcing and reentrained into the surface mixed layer. Since reemergence is considered to play an important role in the Pacific Decadal Oscillation, it is important to understand its mechanisms, but past studies are mostly based on statistical analyses. Therefore, in this thesis, the mechanisms of reemergence in the North Pacific is clarified quantitatively by an online mixed layer heat budget analysis with an ocean model simulation.

Following a method proposed by a previous study, areas with reemergence are detected and the focus of this study is the Reemergence Area (RA, 35˚-40˚N, 155˚-145˚W) in the central North Pacific. In the RA, the Reemergence Years (RYs) are determined and the mixed layer heat budget analysis is conducted with the integration of the Regional Ocean Model System (ROMS) covering the RA. In contrast to past studies that suggested importance of anomalous entrainment term, it is shown that several mechanisms are operating in reemergence. In particular, the anomalous Ekman meridional advection of the mean meridional temperature gradient induced by zonal wind stress anomalies plays an important role in many RYs. Also, coincidence in the sign of SST anomalies in winter and surface heat flux anomalies in the following autumn leads to recurrence of SST anomalies in some RYs. On the other hand, the conventional

mechanism related to the mean entrainment of anomalous temperature contributes to reemergence in two RYs.

Keywords: Reemergence, North Pacific, mixed layer heat budget analysis

