

Interannual Salinity Variability Associated with the Central Pacific and Eastern Pacific El Niños in the Tropical Pacific

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El Niño exhibits diversity and modulation as indicated by the central Pacific (CP) El Niño and the eastern Pacific (EP) El Niño. Previously, sea surface temperature (SST) has been commonly used to characterize the differences in the two types of El Niño. But, physical processes responsible for the occurrence of the two types of El Niño are still not understood well. Here, ocean reanalysis products and observations are used to analyze the relationships between the two types of El Niño and interannual salinity variability; a budget analysis for mixed-layer salinity (MLS) is performed in the tropical Pacific. The center of negative MLS anomalies in winter tend to move further westward with the CP El Niño, compared with the EP El Niño. The oscillation period with the EP El Niño is found to be approximately 10 years, longer than that with the CP El Niño (approximately 6-8 years). Our results reveal that surface advection, surface forcing and subsurface effect are the three main contributors to mixed layer (ML) tendency of interannual salinity variability, which are regionally dependent. In the eastern edge of the warm pool (WP), surface advection makes a larger contribution (about 40-60 %) to the MLS budget, and subsurface effect (about 20%) and surface forcing (about 20-40%) are relatively smaller; in contrast, in the South Pacific Convergence Zone (SPCZ), the latter two processes make a larger contribution (about 60%). The subsurface effects on the MLS tendency tend to compensate for the imbalance induced by surface forcing and advection: a weakened MLS tendency occurs with the CP El Niño, whereas an enhanced MLS tendency occurs with the EP El Niño, respectively. The MLS tendency leads Niño3.4 by 12 months for the EP El Niño, whereas there is no such significant lead/lag relationship for the CP El Niño. It is demonstrated that the relationships between the interannual SST variability and MLS budget terms can be a clear indicator to distinguish the two types of El Niño.

Keywords: eastern and central Pacific El Niño, mixed layer salinity variability, salinity budget