

Hypothesis on Annual Sea Level Variation and Increased Volume Transport in Korea Strait

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Abstract : Kim et al., hypothesized an increase in volume transport in the Korea Strait based on the concurrent increase in water temperature and mean sea level observed by the Korea Hydrographic and Oceanographic Agency (KHOA) in the vicinity of the Korea Strait from 2000 to 2009. Since then, to our best knowledge, no definitive studies have been reported on the increase in volume transport through the Korea Strait, but the observed water temperature (2000-2021) and sea level (1989-2021) in the Korea Strait and East Sea have been found to be increasing. In particular, the rapid increase rate in the mean sea level rise (2.55~3.53 mm/y) in these areas cannot be explained by only steric effect due to the increased water temperature. It is more reasonable interpretation that the sea level rise is due to an increase in the volume transport of warm and salty currents. If the increase in the volume transport is explained by the geostrophic equation without considering the sea level rise in the Korea Strait, the current velocity should increase. However, up to now, there are no reports of an increase in current velocity from direct observations using ADCP (e.g., observations of Camellia) or from various numerical models. Therefore, the increase in volume transport cannot be explained by the geostrophic equation. Another possible explanation for the increase in the volume transport is the effect of wind. Although Korea is dominated by monsoon, it is affected by winds according to El Niño and La Niña, which have a cycle of about 3 to 4 years. During El Niño (La Niña), northerly winds (southerly winds) prevail in Korea. Consequently, it is inferred that the transported volume in the Korea Strait slowly increases interannually. However, in this study, it was difficult to find a clear correlation between annually-averaged mean sea level and El Niño (or La Niña) during 1989-2021. This is probably due to the interactions of the PDO (Pacific Decadal Oscillation) and AO (Arctic Oscillation) along with the ENSO (El Niño-Southern Oscillation). However, it is clear that the interannual variability of winds is affecting the volume transport in the Korean Strait. On the other hand, the effect of global sea level rise on the volume transport in the Korea Strait is small compared to the interannual variability of the volume transport, but it seems to play a constant role.

Keywords : mean sea level, volume transport, El nino, La nina

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