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Subsurface temperature estimation from climatology and satellite SST for the sea around Korean Peninsula

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Subsurface temperature plays an important role in determining heat contents in the upper ocean which are crucial in long-term and short-term weather systems. Furthermore, subsurface temperature affects significantly ocean ecology. In this study, a simple and practical algorithm has proposed. If we assume that subsurface temperature changes are proportional to surface heating or cooling, subsurface temperature at each depth (*Sub_temp*) can be estimated as follows

where i is depth index, *Clm_temp* is temperature from climatology, *dif0* is temperature difference between satellite and climatology in the surface, and *ratio* is ratio of temperature variability in each depth to surface temperature variability. Subsurface temperatures using this algorithm from climatology (WOA2013) and satellite SST (OSTIA) where calculated in the sea around Korean peninsula. Validation result with in-situ observation data show good agreement in the upper 50 m layer with RMSE (root mean square error) less than 2 K. The RMSE is smallest with less than 1 K in winter when surface mixed layer is thick, and largest with about 2$\sim$3 K in summer when surface mixed layer is shallow. The strong thermocline and large variability of the mixed layer depth might result in large RMSE in summer. Applying of mixed layer depth information for the algorithm may improve subsurface temperature estimation in summer. Spatial-temporal details on the improvement and its causes will be discussed.