



## **Long-term variability of observed upper-ocean temperature in the western North Pacific marginal seas**

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Interannual to decadal variability and linear trend of observed surface temperature data in the western North Pacific marginal seas (i.e. East China Sea, Yellow Sea, and East/Japan Sea) are investigated and compared with those of observed subsurface temperature data from World Ocean Database and other in situ datasets. Limited number of observation data is available for understanding a century-long variation over the region, whereas more than half the area is relatively well sampled in the recent 40 years. An overall surface warming signal, which is larger than the northern hemispheric average, is observed and it is particularly strong mainly following the western boundary current region. The warming trend is superimposed with decadal variability and exhibits spatial dependency associated with ocean circulation over the region. In the subsurface layer, the decadal variability and spatial dependency become dominant than the overall warming signal. Responsible ocean current variability and large-scale atmospheric variability is suggested and their role in the upper-ocean vertical discrepancy in terms of trend is discussed.