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EOF analysis of long-term reconstructed AVHRR Pathfinder SST in the South China Sea

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Sea surface temperature (SST) is one of the key variables often used to investigate ocean dynamics, ocean-atmosphere interaction, and climate change. For recent decades, the AVHRR Pathfinder SST, measured by infrared sensors, has been widely used because of its high resolution and long time-series. The disadvantage of the AVHRR Pathfinder SST is high percentage of missing data due to cloud coverage. This becomes more serious in the South China Sea (SCS) because it is located in the tropical region, frequently covered by clouds. In this study, we used the Data INterpolating Empirical Orthogonal Functions (DINEOF) method to reconstruct daily night-time 4 km AVHRR Pathfinder SST spanning from 1989 to 2009 for the whole SCS. In order to better understand the spatial and temporal variability of the SCS SST, an EOF analysis of the reconstructed field is performed in association with surface wind. The first SST mode, accounting for 69% of the variance, presents the cooling (warming) of the basin due to the solar inclination through seasons, water exchange, topography, and monsoon-induced cyclonic circulation. The second SST mode, explaining 24.8% of the variance, shows the advection of cold and warm water from two opposite directions along the southwest-northeast diagonal of the basin. The second SST mode is affected by the atmospheric anticyclone (cyclone) located over the Philippine Sea. Comparing both SST modes with Nino3.0 index, it shows that the interannual variability of the SCS SST is influenced by the moderate and strong ENSO events with a lag of 5-6 months. Moreover, the analysis of the high-resolution reconstructed dataset reveals some oceanic features that could not be captured in the previous EOF analyses.