

Summertime Upwelling in the Central South China Sea: Interannual Variability and Associated Dynamics

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Based on the 30-year sea surface temperature images, we classify the locations of Vietnamese upwelling centers into three sub-regions: the Northern Coastal Upwelling region (*NCU*; north of 12.5°N), the Southern Coastal Upwelling region (*SCU*; south of 12.5°N), and the Offshore Upwelling region (*OU*; east of 110°E). Variations of upwelling intensities in the three sub-regions are further quantified via the SST-based upwelling index, and possible processes relevant to wind field (including wind stress and its curl) and currents off southern Vietnam are, respectively, proposed. The outcomes show that as the summer monsoon enhance, the alongshore wind stress strengthens offshore Ekman transport along the coast in the *SCU*, intensifying the coastal upwelling there. At the same time, the enhanced wind stress curl (WSC) dipole off the southern Vietnam strengthens the underlying oceanic gyre dipole, further leading to an intensification of the eastward-flowing jet in-between and southward-movement of the jet. As a result, the scaled up cyclonic gyre north of the jet helps the upwelling occurring in the *OU* region. Besides, accompanying the cyclonic gyre north of the jet, a southward counter-current develops along the eastern Vietnamese coast; further, it restricts upwelling in the *NCU* region but intensifies upwelling in the *SCU* region.