Seasonality and Regional Characteristics of Sea-Surface Wind Responses to Mesoscale SST Features assessed by Transfer Functions

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Satellite observations have revealed that sea-surface temperature (SST) anomalies on a scale of 50–500 km exert significant influence on sea-surface winds. Warm (cold) SST anomalies act to accelerate (decelerate) surface winds. Recently, spectral transfer function approach, where the surface wind response is evaluated using linear regression coefficients on the wavenumber space, has been proposed to investigate the mesoscale air-sea coupling. In the present study, seasonality and regional differences of the wind responses are investigated by adopting the transfer function approach to the Gulf Stream, Kuroshio Extension, Southern Ocean regions based on satellite observations. Although structures of the transfer functions in the wavenumber space exhibit consistent characteristics between the ocean regions, their magnitude is found to be dependent on regions and seasons. When background winds are strong (weak), the mesoscale wind responses tend to be stronger in winter (summer). Furthermore, observed mesoscale wind fields are reasonably reconstructed from the transfer functions and observed SST, especially over the Southern Ocean domain. These results further support the validity of using transfer functions, and suggest that underlying dominant dynamics are ubiquitous over the globe.

Keywords: air-sea interaction, mesoscale

