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Influence of tropical Pacific winds at different timescales on ENSO evolution

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Winds play a key role in the onset, evolution, and decay of El Niño Southern Oscillation (ENSO) events. Low-frequency anomalous westerlies accompany tropical Pacific interannual sea surface temperature (SST) anomalies, while high-frequency wind variations in the form of Westerly Wind Events (WWEs) can trigger El Niños through the excitation of oceanic equatorial Kelvin waves. Previous studies have indicated that high-frequency wind variations are not purely stochastic atmospheric noise, but are energized and strengthened by the SST anomalies themselves, effectively behaving as a state dependent multiplicative noise. The relative sparsity of long term in situ observations, and the limited duration of satellite retrievals have until recently hampered a systematic and comprehensive analysis of tropical Pacific winds across all these timescales. In this study, we use the newly reprocessed cross-calibrated multi-platform wind vector data set Version 2 (CCMP-V2), which combines intercalibrated satellite and buoy winds over the period 1988-2015, and provides wind speed and direction from sub-daily to interannual scales over the global ocean. After examining the reliability of CCMP-V2 in the tropical Pacific region, we use this data set to provide a comprehensive spectral characterization of the tropical winds, and examine the interplay of interannual and subseasonal time scales at different longitudes during El Niño, La Niña, and neutral conditions. This analysis can help to isolate the stochastic and SST-driven components of the WWEs, and provide a spectral baseline for reanalysis and climate model evaluation.