A long, consistent surface wind dataset for climate change analysis: Application over the tropical Indo-Pacific

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Surface wind change is a principal factor for spatial patterns of sea surface temperature (SST) warming through changes in surface evaporation, ocean vertical mixing and wind-driven ocean circulation. However, historical ship-based measurements of sea surface wind speed displays a spurious upward trend due to increases in anemometer height. To correct this bias, we construct the Wave- and Anemometer-based Sea Surface Wind (WASWind) dataset for the last six decades from ICOADS ship reports, applying height correction for anemometer measured winds, rejecting spurious Beaufort winds, and using wind wave height to estimate wind speed. WASWind substantially reduces the upward trend in wind speed and its trend patterns are quite similar to satellite-measured surface wind changes for the recent two decades. Surface wind changes in WASWind are consistent with historical sea level pressure observations over the global oceans, illustrating its utility for climate change analysis. As an example, WASWind captures a slow down of the Walker Circulation over the last six decades. The surface wind changes are also consistent with those in cloudiness and subsurface ocean temperature in the tropical Indo-Pacific. The agreement in trend pattern with such independent observations illustrates the utility of WASWind for climate trend analysis.