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Identification and Attribution of Global Wind Speed Trends at 100m

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Recent studies have found evidence that global climate change significantly alters the strength of large-scale wind patterns. Any enduring trends over large regions are potentially of value to understand due to their implications for the wind energy industry. In this study we identify and evaluate global wind speed trends at the wind turbine hub height (∼100m) through the use of CMIP5 models, standard reanalyses (ERA-Interim, NCEP2) and a uniquely high-resolution analysis dataset (Vestas Mesoscale Library). By analyzing how wind speeds change across the globe throughout the period 1900-2100 (with emphasis on the satellite era, 1979-2014), we assess the significance of multi-decadal wind speed trends in the context of natural spatial and temporal variability. Our results show substantial differences in regional trends between different datasets though several regions including the Southern Hemisphere mid-latitudes and the Caribbean show consistently substantial changing wind speeds during the satellite era. Wind speed trends tend to diminish over large time scales and follow spatial patterns that link multi-decadal trends to the evolving behaviors of internal variability modes, especially those of ENSO and the Southern Annular Mode (SAM).