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Intensification and Poleward Shift of Compound Wind and Precipitation Extremes in a Warmer Climate

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Compound wind and precipitation extremes (CWPEs) can severely impact natural and socioeconomic systems. However, our understanding of CWPE future changes, drivers, and uncertainties under a warmer climate is limited. Here, analyzing the event both on oceans and landmasses via state-of-the-art climate model simulations, we reveal a poleward shift of CWPE occurrences by the late 21st century, with notable increases at latitudes exceeding 50° in both hemispheres and decreases in the subtropics around 25°. CWPE intensification occurs across approximately 90% of global landmasses, especially under a high-emission scenario. Most changes in CWPE frequency and intensity (about 70% and 80%, respectively) stem from changes in precipitation extremes. We further identify large uncertainties in CWPE changes, which can be understood at the regional level by considering climate model differences in trends of CWPE drivers. These results provide insights into understanding CWPE changes under a warmer climate, aiding robust regional adaptation strategy development.