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Weakening of Northwest Pacific Anticyclone Anomalies during Post–El Niño Summers under Global Warming

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The northwest Pacific anticyclone (NWPAC) anomalies during post–El Niño summers are a key predictor of the summer climate in East Asia and the northwestern Pacific (NWP). Understanding how this will change under global warming is crucial to project the changes in the variability of the northwest Pacific summer monsoon. Outputs from 18 selected coupled models from phase 5 of the Coupled Model Intercomparison Project show that the anomalous NWPAC response to El Niño will likely be weakened under global warming, which is attributed to the decreased zonal contrast between the tropical Indian Ocean (TIO) warming and the NWP cooling during post–El Niño summers. Under global warming, the NWPAC anomalies during the El Niño mature winter are weakened because of decreased atmospheric circulation in response to El Niño–Southern Oscillation (ENSO), which leads to the weakening of local air–sea interaction and then decreases the cold NWP SST anomalies. Furthermore, the decreased surface heat flux anomalies, the weakened anticyclone anomalies over the southeastern Indian Ocean, and the slackened anomalous easterlies over the north Indian Ocean weaken the warm TIO SST anomalies. However, the strengthened tropospheric temperature anomalies could enhance the anomalous TIO warming. Although the changes in TIO SST anomalies are indistinctive, the weakening of the SST anomaly gradient between the TIO and the NWP is robust to weaken the NWPAC anomalies during post–El Niño summers. Moreover, the positive feedback between the TIO–NWP SST anomalies and the NWPAC anomalies will enhance the weakening of NWPAC under global warming.