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Contrast of Mean Flow and Storm Track Relationships Associated with the Two Types of El-Niño Events

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The present study distinguishes the distinct features of large-scale circulation, storm tracks and the dynamical relationship between them through investigating Rossby wave breaking (RWB) processes associated with Eastern Pacific (EP) and Central Pacific (CP) El-Niño events. During EP El-Niño, geopotential height anomalies at 500 hPa (Z500) exhibit the Pacific North America (PNA) pattern. Correspondingly, both the jet and storm track in the North Pacific are strengthened and extend downstream. During CP El-Niño, Z500 anomalies show a north-south dipole pattern over the North Pacific, and the jet as well as the storm track shift equatorward there. The anticyclonic wave breaking (AWB) occurs less frequently in EP El-Niño years, while cyclonic wave breaking (CWB) occurs more frequently in CP El-Niño years over the North Pacific sector. Outside the North Pacific, more CWB occurs over North America during EP El-Niño years while no signal is found during CP El-Niño years.

The dynamical linkage between individual AWB/CWB events and the mean flow is used to understand the respective anomaly patterns under the two types of El-Niño conditions. The composite results show that AWB events always go along with a monopole high anomaly in Z500. Therefore, Z500 significantly decreases in the North Pacific when AWB occurs less frequently there during EP El-Niño. CWB events show increasing (decreasing) Z500 to the northeast (southwest) of the breaking centers. It follows that more frequent CWB events in the North Pacific under CP conditions and North America under EP conditions go along with northeast-southwest aligned dipole patterns in anomalous Z500. Composites of zonal wind anomalieshorizontal $\overrightarrow{E}$ and lead-lag composites of $\nabla \cdot \overrightarrow{E}$ with respect to RWB show that the maximum eddy momentum forcing and maximum zonal wind anomaly occur around the mature phase of RWB, demonstrating the strong dynamical linkage between RWB and the mean flow anomalies. The anomalies in the frequency of RWB events act to invigorate and reinforce the circulation anomalies over the North Pacific and North American region linked with the two types of El-Niño.