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Processes of jet variability and their relationship to extratropical teleconnections

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The signature of extratropical teleconnection patterns can be described in terms of distortions of the midlatitude jets. We investigate the relationship between the low frequency teleconnection patterns and atmospheric variability in the ERA-40 reanalysis, basing the comparison on two important dynamical processes that influence the extratropical zonal wind field: angular momentum transport by the Hadley circulation (thermal driving), and momentum flux convergence by atmospheric waves that develop in regions of enhanced baroclinicity (eddy driving). Composites of the zonal wind field based on indices of thermal and eddy driving exhibit characteristic signatures that resemble the leading patterns of extratropical variability. In the Atlantic sector, zonal wind variability is mainly associated with momentum flux convergence by atmospheric waves, supporting the established view that the Atlantic jet is primarily eddy-driven. In the Pacific sector, there is evidence for zonal wind variability associated with both driving processes, indicating that the Pacific jet should be considered both thermally-driven and eddy-driven. The thermally-driven Pacific signature reflects changes in the strength (intensity and longitudinal extent) of the Pacific jet that resemble the zonal wind response associated with the Pacific-North America (PNA) pattern. The eddy-driven signature in both sectors reflects a latitudinal shifting of the jet exit region that resembles the zonal wind response associated with the North Atlantic Oscillation (NAO) or West Pacific (WP) patterns.