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Inter-basin link between the North Pacific and North Atlantic in the upper troposphere: Its dominance and seasonal dependendence

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Inter-basin links between the North Pacific and North Atlantic in the wintertime upper-tropospheric circulation over the extratropical Northern Hemisphere, including their structure, dominance and seasonal dependence, are examined based on the structures of the leading EOFs for monthly height anomalies for the second half of the last century. Dominant variability in the upper troposphere is found to reflect the corresponding modulations in the strength of the inter-basin dynamical link between the North Pacific and North Atlantic. The first and second EOFs for the upper troposphere represent hemispheric patterns, showing the coherent variability between the North Pacific and North Atlantic. They essentially reflect the respective out-of-phase and in-phase relationships between the Icelandic low (IL) and Aleutian low (AL), as upper-level manifestations of the AL–IL seesaw and the cold ocean–warm land (COWL) pattern, respectively. Dominance of the AL–IL seesaw in the upper-tropospheric leading EOF is a manifestation of a dynamical linkage between the North Atlantic Oscillation and Pacific–North American pattern. The manifestation of the COWL pattern in the second EOF is consistent with a pronounced wintertime warming trend over landmasses and concomitant deepening of the AL and IL observed in the last three decades. The seasonal evolution of the AL–IL seesaw and COWL pattern also manifest themselves in the seasonal modulations in the first and second EOFs of the upper-tropospheric variability, respectively.