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Climate history of the past millennium in western North America from carbon and oxygen isotopes in tree rings and implications for precipitation isotope-temperature relations

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Coupled response-surface deconvolution of composite decadal δ^{13}C and δ^{18}O dendrochronologies from the eastern Rocky Mountains of western Canada supports robust reconstructions of changing growth season atmospheric relative humidity and mean annual temperature over the past millennium. Key features of the inferred climate history include pronounced moisture and temperature maxima spanning AD 1100-1250, correlating with the classical "High Medieval" of the Medieval Warm Period, and intriguing step-shifts in the inferred moisture-temperature relations (and/or δ^{18}O-T relations) in the mid 1500s and late 1800s that clearly bracket the beginning and end of the Little Ice Age. The records also exhibit remarkable correspondence with a variety of other independent proxies, including the maximum LIA glacial expansion in the early 1700s and the subsequent less-extensive glacial advances in the mid-1800s, as well as variations in streamflow and episodes of hydrological drought in rivers draining the eastern Rockies. The step-shifts at the MWP-LIA and LIA-postLIA transitions also correspond closely with transitions between periods of predominantly positive and negative North Atlantic Oscillation index according to recent tree-ring based reconstructions, suggesting direct links to changes in circumpolar atmospheric circulation.