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Atmospheric jet transitions and abrupt events over the INTIMATE period

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Atmospheric jet streams are a key feature of the global scale wind systems that shape Earth's climate. It has been suggested that the variability ("wobble") of the North Atlantic jet can account for many millennial-scale features of the INTIMATE period, for example, the existence of Dansgaard-Oeschger cycles during the glacial, the absence of Dansaard-Oeschger cycles at the Last Glacial Maximum (LGM), and European climate changes during the onset and transition out of the Younger-Dryas (e.g., Seager and Battisti 2007, Brauer et al. 2008, Bakke et al. 2009). Proxy records now provide a more complete picture of the timing and geographic patterns of these features than ever before, while model simulations of past climates continue to improve in resolution and quality. This signals a ripe opportunity to address mechanisms of past climate change through novel approaches for model-data comparison. This study presents new diagnostics of North Atlantic jet variability in time slice simulations through the deglaciation. By examining the frequency distribution of jet location, we find a transition from a steady, zonal glacial jet to a wobbly jet with North Atlantic Oscillation (NAO)-like variability, as in today's climate. The diagnostic allows for more direct interpretations of changes recorded in high-resolution terrestrial records from laminated lake sediments and speleothems, an advantage over other ways of characterizing jet variability such as empirical orthogonal functions or time-averaged variance maps. Additional sensitivity experiments suggest that the jet transition is mainly linked to the size of the Laurentide Ice Sheet over North America, with a smaller role for North Atlantic sea ice cover.