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Future changes in poleward moisture transport variability associated with atmospheric rivers

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The hydrological cycle in the Arctic is intensifying due to climate change, which could modify the climate locally, but also worldwide. For example poleward moisture transport (PMT) is projected to increase in a future climate as well as its interannual variability, mainly in summer. While the first can be attributed to increased atmospheric moisture content, the cause of the latter is still uncertain. We used the global climate model EC-Earth to examine to what extent PMT variability can be linked to atmospheric rivers (ARs) in present and future climates (2C and 3C warmer than the pre-industrial climate). It is found that most PMT variability is driven by Arctic ARs, especially over the Atlantic Ocean and to a lesser extent over the Bering Strait. In years with high PMT, a relatively large share is transported by ARs, up to 50% in the present-day climate. Moreover, our findings suggest that interannual AR-related PMT variability is more sensitive to variations in AR-intensity compared to AR-frequency in the present as well as in warmer climates. This implies that increasing interannual PMT variability is dominantly driven by the increase in PMT per AR rather than the increase in AR-occurrence. Finally, our results point at a strong contribution of ARs to interannual variability of Arctic precipitation and temperature patterns.