Decadal variability in the impact of atmospheric circulation patterns on the winter climate of northern Russia

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The Arctic continues to warm at a much faster rate than the global average. One process contributing to 'Arctic amplification' involves changes in low-frequency macro-scale atmospheric circulation patterns and their consequent influence on regional climate. Here we examine decadal changes in the impact of seven such patterns on winter near-surface temperature (SAT) and precipitation (PPN) in northern Russia and calculate the temporal consistency of statistically significant relationships, a simple metric that can be utilized to test and improve the uncertainty estimates of future climate projections. We demonstrate that there is considerable decadal variability in significant circulation pattern-climate relationships across the region, with few areas where their temporal consistency exceeds 60%: this is primarily a response to the pronounced decadal expansion/contraction and/or mobility of the circulation patterns' centers of action. The North Atlantic Oscillation (NAO) is the dominant pattern (having the highest temporal consistency) affecting SAT west of the Urals. Further east, the Scandinavian (SCA), Polar/Eurasia (POL) and West Pacific patterns are successively the dominant pattern influencing SAT across the West Siberian Plains, Central Siberian Plateau and mountains of Far East Siberia, respectively. In contrast, the NAO has relatively little impact on PPN other than in the very west of the region. Instead, from west to east, the SCA, POL and Pacific North American patterns exert the most consistent decadal influence on PPN. The only temporally invariant significant decadal relationships occur between the NAO and SAT and the SCA and PPN in small areas of the North European Plain.