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# Arctic and mid-latitude teleconnections affecting European winter weather

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We analyse effects of Arctic warming, Greenland blocking, North Atlantic Oscillation (NAO), Scandinavian Pattern (SCA), and Ural/Siberian high-pressure pattern on European winter weather. On the basis of atmospheric reanalyses data from 1979-2015, we show that Arctic warming affects European winter weather both directly and indirectly. The most obvious direct effect is that air masses advected from the Arctic to Europe have become warmer during this century. The indirect effects work via modulation of large-scale atmospheric circulation in a way that in winter tends to oppose, but generally not dominate, climate warming. Arctic warming, in particular sea ice decline, favours the positive phase of SCA in December and January and the negative phase of NAO in February and March. An increased frequency in long-duration events associated with the negative phase of NAO favours persistent cold winter weather in western, central and northern Europe. Warm anomalies over the central Arctic seem to be a stronger factor controlling cold events in southern and eastern Europe. Greenland Blocking has also increased in the recent period of Arctic Amplification, and is linked with (at times) increased rainfall over Northwest Europe. Sea-ice decline in the Barents and Kara seas initiates complex troposphere-stratosphere interactions, which strengthen the Ural/Siberian high-pressure pattern. This favours winter cooling in north-eastern Europe, but only in cases of air masses originating from the southeast, this cooling mechanism has dominated climate warming. The cooling associated with southeasterly airmass origin has to a large part been due to a decrease in adiabatic subsidence heating during the air flow to northeastern Europe.