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Title: *Impact of snow cover and sea ice on seasonal predictions in the Arctic*

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Surface conditions at high northern latitudes, such as snow cover or sea ice, act as a boundary forcing which influences not only local meteorological conditions, but also atmospheric teleconnections. We highlight recent results on the modeling of the impact of such boundary conditions on Arctic predictability from the seasonal to decadal time-scale, using the coupled atmosphere-ocean ensemble seasonal prediction model of the European Centre for Medium-Range Weather Forecasts (ECMWF).

Many observational and model studies have indicated that the autumn Eurasian snow cover influences circulation patterns over the North Pacific and North Atlantic. We have performed a suite of forecasts to investigate the impact of accurate snow initialisation on the seasonal timescale. Pairs of two-month ensemble forecasts were started twice a month from October through December over the years 2004-2009, with either realistic or else “scrambled” snow initial conditions. The influence of a thick snowpack on surface temperature turns from an initial cooling over the continental land masses of Eurasia and North America, to a dipolar pattern with warming over the Arctic and cooling over middle latitudes of Eurasia (akin to the warm Arctic/cold continent paradigm) in association with an intensification and westward expansion of the Siberian High. These results highlight the importance of the Eurasian snow cover for seasonal Arctic predictions.

We also characterise the autumn and early winter atmospheric response to low summer Arctic sea ice extent of 2007, using forecasts with realistic sea ice initialization. Warm autumn anomalies over the Pacific and Siberian sectors of the Arctic are found in autumn. By December, a regime change is occurring, and hindcast anomalies consist of stronger highs over the continents, and intensified meandering upper-level jets over both oceanic sectors. A potential predictability analysis indicates the strongest sensitivity of surface temperatures to be along the Pacific coast of Asia.