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Impact of snow initialization on sub-seasonal forecasts

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The influence of the snowpack on wintertime atmospheric teleconnections has received renewed attention in recent years, partially for its potential impact on seasonal predictability. Many observational and model studies have indicated that the autumn Eurasian snow cover in particular, influence circulation patterns over the North Pacific and North Atlantic, and may even condition the phase of the North Atlantic Oscillation (NAO) in the following winter.

We have performed a suite of coupled AOGCM simulations with the European Centre for Medium-Range Weather Forecasts (ECMWF) ensemble forecast system to investigate the impact of accurate snow initialisation on seasonal forecasts. Pairs of two-month ensemble forecasts were started every 15 days from October through December over the years 2004-2009, with either realistic initialization of snow variables based on re-analyses, or else with "scrambled" snow initial conditions from an alternate date or year.

The impact of realistic snow initialization upon the forecast skill is estimated for various lead times. We find a surface temperature skill increment over the Arctic at a 30-day lead, attributed to realistic snow initialization. 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 warming over the Arctic and high latitudes of Eurasia due to an intensification of the Siberian High.