Added value of springtime Arctic sea ice concentration assimilation for summer and fall climate predictions

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Abstract

Seasonal forecasting primarily aims to deliver climate information for the coming months/seasons to a wide range of potential users. Valuable predictions are limited in midlatitude land regions in the northern hemisphere and progress has been slow. Seasonal predictability largely originates from the evolution of predictable components of the climate system with slow variability such as the ocean, land or sea ice.
Northern hemisphere (NH) midlatitudes are affected by Arctic sources of predictability, and sea ice is one such source due to its slow variability and the central role it plays in the Arctic climate system. In the satellite era, Arctic sea ice has declined, the lower atmosphere has warmed much faster than the global mean, and the warming has been strongest in the fall and winter. The seasonality of the Arctic warming has motivated the majority of studies linking Arctic sea ice loss and midlatitude climate, which mainly focused on late fall and winter, while other seasons have been less studied.

We use ensembles of climate model simulations initialized in spring (retrospective predictions) with and without Arctic sea ice concentration assimilation from satellite observations, to diagnose the sea ice effect on NH midlatitude climate in the following summer and fall. Our strategy allows for a systematic quantification of climate prediction skill against observational products and a more realistic present day climate simulation state and variability than with a traditional non-initialized climate model approach. The advantages of sea ice concentration assimilation in terms of forecast skill and the mechanisms linking the Arctic and midlatitudes via sea ice-ocean-atmosphere interactions at different timescales will be discussed.

Keywords: Seasonal, Forecasts, Sea, ice, Arctic, Mid, latitude, teleconnections

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