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Regional Arctic sea ice variations as predictor for winter climate conditions

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Seasonal prediction skill of winter mid and high northern latitudes from sea ice variations in eight different Arctic regions is analyzed using detrended ERA-interim data and satellite sea ice data for the period 1980-2013.
We find significant correlations between ice areas in both September and November and winter sea level pressure, air temperature and precipitation. The prediction skill is improved when using November sea ice conditions as predictor compared to September. This is particularly true for predicting winter NAO-like patterns and blocking situations in the Euro-Atlantic area. We find that sea ice variations in Barents Sea seem to be most important for the sign of the following winter NAO - negative after low ice - but amplitude and extension of the patterns are modulated by Greenland and Labrador Seas ice areas. November ice variability in the Greenland Sea provides the best prediction skill for central and western European temperature and ice variations in the Laptev/ East Siberian Seas have the largest impact on the blocking number in the Euro-Atlantic region. Over North America, prediction skill is largest using September ice areas from the Pacific Arctic sector as predictor.
Composite analyses of high and low regional autumn ice conditions reveal that the atmospheric response is not entirely linear suggesting changing predictive skill dependent on sign and amplitude of the anomaly.
The results confirm the importance of realistic sea ice initial conditions for seasonal forecasts. However, correlations do seldom exceed 0.6 indicating that Arctic sea ice variations can only explain a part of winter climate variations in northern mid and high latitudes.