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Seasonal Prediction of Temperatures in Europe from Arctic Sea Surface Temperatures

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Seasonal weather predictions are helpful tools for risk mitigation, and can be used to guide more efficient use of resources in various sectors of society. Arctic anomalies of sea ice extent and sea surface temperature (SST) are skillful predictors of weather anomalies in the mid-latitudes on the seasonal time scale. In particular, lower-than-normal sea ice extent in the Barents Sea in autumn often predates cold winters in parts of Eurasia. Here we present our answers to three questions pertaining to the potential for predicting seasonal surface air temperature (SAT) in Europe from SSTs in the Nordic Seas. First, we show that autumn SST anomalies not just in the Barents Sea, but also along the warm Norwegian Atlantic Current, can be used to predict wintertime SAT anomalies in Europe. The predictability from Barents Sea SST anomalies in autumn is likely mediated by North Atlantic Oscillation (NAO) anomalies in winter, which again influence European SATs. There is also a non-negligible potential for prediction during other times of the year. Second, we demonstrate that the predictive skill is in some cases sensitive to whether or not the underlying data have been detrended, depending on the strength of the trends. In particular, European SAT anomalies in spring and summer appear to be predictable from SST anomalies one season ahead, but this is largely because of inflated correlations due to underlying warming trends. Third, we show that the potential for prediction is non-stationary in time, using the CERA-20C twentieth century reanalysis and a time series of Central England Temperature (CET). The high skill during recent decades appears to be nearly unprecedented throughout the period after 1900.

In addition to these results, we will also briefly present a new project led by Kolstad. The vision of Seasonal Forecasting Engine is to meet a growing demand in the private and public sectors for advanced, relevant and applicable seasonal climate predictions to support risk management and operational planning in Northern Europe and the Arctic.