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# September Arctic Sea Ice minimum prediction – a new skillful statistical approach

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Sea ice in both Polar Regions is an important indicator for the expression of global climate change and its polar amplification. Consequently, a broad interest exists on sea ice, its coverage, variability and long term change. Knowledge on sea ice requires high quality data on ice extent, thickness and its dynamics. However, its predictability is complex and it depends on various climate and oceanic parameters and conditions. In order to provide insights into the potential development of a monthly/seasonal signal of sea ice evolution, we developed a robust statistical model based on ocean heat content, sea surface temperature and different atmospheric variables to calculate an estimate of the September Sea ice extent (SSIE) on monthly time scale. Although previous statistical attempts at monthly/seasonal forecasts of SSIE show a relatively reduced skill, we show here that more than 92% (r = 0.96) of the September sea ice extent can be predicted at the end of May by using previous months' climate and oceanic conditions. The skill of the model increases with a decrease in the time lag used for the forecast. At the end of August, our predictions are even able to explain 99% of the SSIE. Our statistical model captures both the general trend as well as the interannual variability of the SSIE. Moreover, it is able to properly forecast the years with extreme high/low SSIE (e.g. 1996/ 2007, 2012, 2013). Besides its forecast skill for SSIE, the model could provide a valuable tool for identifying relevant regions and climate parameters that are important for the sea ice development in the Arctic and for detecting sensitive and critical regions in global coupled climate models with focus on sea ice formation.