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Summertime atmospheric circulation response to Arctic sea ice loss in uncoupled and coupled simulations

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In this work the summertime mid-latitude circulation response to the loss of Arctic sea ice is investigated as it has received relatively less attention than the wintertime response. Since summer has an inherently lower range of natural variability a signal of circulation change may possibly be seen in summertime first.

This presentation will discuss the observed summertime circulation anomalies and present results from atmosphere only and fully coupled ice-ocean-atmosphere experiments that simulate the recent loss of Arctic sea ice in an idealised manner. The fully coupled experiments account for the thinning of the Arctic sea ice and allow for more complex interactions between the ice, ocean and atmosphere in contrast with atmosphere-only experiments in which the sea ice concentration and sea surface temperatures are prescribed.

Results from both the uncoupled and coupled experiments suggest that there is a significant circulation response in the Northern Hemisphere mid-latitudes in summertime. Positive surface heat flux anomalies in the Labrador sea and Hudson Bay region result in positive tropospheric temperature anomalies which influences the strength of the jet stream over the North Atlantic. The physical mechanism which links the loss of Arctic sea ice to the summertime mid-latitude circulation, including the contribution of ice-ocean-atmosphere fluxes, will be discussed.