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Title: *Interaction between Arctic sea ice and the atmospheric circulation*

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Ensemble simulations with a coupled regional Arctic atmosphere-ocean-sea ice system model from 1948-2008 have been carried out. As the atmospheric circulation in winter is much stonger constrained by the lateral boundary forcing, the coupled regional model has higher degrees of freedom to develop internal circulation structures in summer. Strong sea ice loss during the summer months is either associated with a higher frequency of high reaching warm anticyclones or reduced cyclone frequency over the Arctic Ocean. The response of the Arctic atmosphere to low and high sea ice concentration phases in the regional climate model simulations have been compared with those based on ERA-Interim atmospheric data.

Regional changes in the autumn sea ice concentration impact due to amplified baroclinic systems on the tropo-and stratospheric winter circulation and the planetary teleconnection patterns. State-of-the-art coupled general circulation models reasonably reproduce the spatial structure of global teleconnection patterns but fail to reproduce their observed temporal behaviour as a result of internally generated climate variability.

To reduce model deficits more reliable sub-grid scale physical parameterizations of Arctic key processes (albedo, surface fluxes, clouds and turbulence in the stable planetary boundary) and of synoptic-scale mean-flow interactions are required.