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Simulated responses of mid-latitude blocking and planetary-wave amplitude to projected Arctic sea ice loss

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As the Arctic continues to warm faster than lower latitudes, thereby reducing the north-south lower tropospheric temperature gradient, it has been hypothesised that mid-latitude blocking and planetary-wave amplitudes will both increase (Francis and Vavrus, 2012; 2015). Further, it has been speculated that such dynamical changes could increase the frequency of persistent and extreme weather patterns. Here we present results from AGCM simulations of two independent CMIP5-class models, both prescribed with projected reductions in Arctic sea ice. All other external forcings and boundary conditions were fixed in order to isolate the response to solely Arctic sea ice loss. Here we focus on cold season (October-March) changes in mid-latitude blocking and planetary-wave amplitude simulated in response to both near-term ($\sim$2040) and far-term ($\sim$2090) projected Arctic sea ice loss. Planetary-wave amplitude is found to be largely insensitive to near-term Arctic sea ice loss. However, wave amplitude decreases in the far-term. These decreases arise because of reduced synoptic variability. Mid-latitude blocking increases between 35-65N in response to both near-term and far-term Arctic sea ice loss, although the longer-term changes are larger in magnitude. These results are compared to analogous experiments conducted in more simplified GCMs and to results from the CMIP5 simulations.