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Impact of sub-seasonal atmosphere-ocean interactions in a large ensemble

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Air-sea coupling is critical in influencing atmospheric temperature and precipitation. The effect of greenhouse gases has influenced atmospheric variability and extreme events. Understanding and quantifying the effect of air-sea feedback on atmospheric variability and extremes remains unknown.

In this work we show results obtained from two numerical experiments. We use the HadSM4 configuration that couples the HadAM4 model at N144 resolution with a Slab Ocean to generate a large ensemble (~1000 members) of realizations of the 2013-14 October-March winter season, forced with a calibrated ocean heat convergence flux.

A twin experiment is performed by forcing HadAM4 with the diagnosed SST and sea ice from the ensemble, yielding a new ensemble with identical realizations of SST and sea ice. The only difference between the two ensembles is the enabling or disabling of the feedback of air-sea heat fluxes on SST.

While the impact of the feedback on the mean climate is relatively small, we show that its influence has important consequences for the variability of many important quantities, including air-sea fluxes and return periods of extreme events.