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The impact of the representation of sea ice in a global coupled atmosphere-ocean model (HadGEM1)

A.B.Keen (1), C.F.Durman (1), A.J.McLaren (1) and J.K.Ridley (1)
(1) Hadley Centre, Met Office, UK (ann.keen@metoffice.gov.uk)

The latest version of the Hadley Centre coupled atmosphere-ocean model (HadGEM1) has an improved simulation of sea-ice when compared to our previous model (HadCM3), particularly in the spatial pattern of ice thickness. The sea ice model in HadGEM1 is physically more realistic than that used in HadCM3. The ice velocities are now calculated assuming an elastic-viscous-plastic rheology (EVP), whereas previously the ice was advected with the ocean surface currents. A multiple ice thickness category model is now included to simulate the sub-gridscale ice thickness distribution (ITD), and a ridging scheme is included to convert thinner ice to thicker ice and create open water within a gridbox.

To understand which model changes have had a significant impact on the simulation of the sea ice, we have run a number of sensitivity experiments varying individual components of the sea ice model. Preliminary results from these experiments will be presented, focusing on the simulation of ice thickness. We find that the inclusion of the EVP dynamics scheme improves the spatial pattern of ice thickness, and the ITD increases the mean ice thickness by allowing increased growth rate. This improves the simulation, particularly in the Arctic.