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Sensitivity of ENSO simulation to coupled model resolution

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In order to study the importance of mesoscale processes to the large-scale mean climate in coupled AOGCMs, a model matrix composed of atmosphere resolutions at 135km and 90km, and ocean models of 1 degree and 1/3 degree, has been developed by the UK-Japan Climate Collaboration project, based on the Hadley Centre HadGEM1 model. All four models in this matrix have been integrated for long enough that both the mean climate, and variability processes such as ENSO, can be studied.

It is found that the high resolution ocean model gives an improved mean state in the tropical Pacific, but it is only with the inclusion of the high resolution atmosphere model that the Nino3 powerspectrum has a realistic peak at 5-6 year period, and ENSO development that agrees well with climatology. The ENSO global teleconnections of SST and precipitation are also much better represented in the fully high resolution coupled model.

The reasons for the improvement in the ENSO simulation at higher resolution are currently being studied, to try and understand interactions due to improved atmospheric "weather" and ocean eddies. Comparison is also underway with the Japanese MIROC model (CCSR/NIES/FRCGC), also integrated at a variety of atmosphere and ocean resolutions, to test whether there are systematic changes to the ENSO representation as model resolution is increased.