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Decadal predictions with the high-resolution HiGEM coupled climate model

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Developing skillful and statistically reliable climate predictions on seasonal to decadal timescales is one of the grand challenges of climate science. Skillful seasonal to decadal predictions would have substantial socioeconomic benefits, informing investment across a wide range of economic sectors. To explore the question of how increased resolution might improve predictions at regional scales, a high resolution global coupled climate model, HiGEM, has been developed. This model is based on the Met Office Hadley Centre global coupled climate model, HadGEM1. In HiGEM the horizontal resolution in the atmosphere is increased to 1.25x0.83 degrees longitude by latitude, while the resolution in the ocean is increased to an eddy-permitting resolution of 1/3x1/3 degrees. Increasing the horizontal resolution results in an improved representation of a number of climate phenomena in HiGEM, including ENSO, Northern Hemisphere planetary waves and subtropical stratocumulus.

We have completed a set of decadal predictions using HiGEM following the CMIP5 protocol, producing an ensemble of 10 year predictions starting every five years from 1960 to 2005. The methodology for the HiGEM decadal predictions is based on that used in Met Office DePreSys system, where the ocean model is initialised using anomaly assimilation. The skill of the HiGEM decadal predictions will be presented. In particular, HiGEM is capable of skillfully predicting the evolution of ocean temperatures in the North Atlantic subpolar gyre on lead times of up to four years.