ESTIMATING UNCERTAINTY IN THE RESPONSE TO DOUBLED CO$_2$ USING A LARGE ENSEMBLE OF GCM VERSIONS.

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For a given emissions scenario, GCM predictions of climate change are subject to uncertainties arising from the representation of climate system processes in the model and the effects of natural variability. These uncertainties imply a probability distribution of outcomes for a given climate variable, which must be specified before quantitative risk assessments can be made. In principle such distributions can be estimated from large ensembles of GCM predictions. In practice this has not hitherto been possible due to a lack of computing power with the result that only crude uncertainty estimates are currently available, based on a handful of models run at different centres.

Preliminary results will be presented from a project aimed at addressing these issues. Frequency distributions of changes in the equilibrium response to doubled CO2 will be illustrated using an ensemble of versions of the Hadley Centre’s coupled atmosphere/mixed layer ocean model, each distinguished by a change to a parameter controlling a key atmospheric process. This will be compared to distributions obtained from an ensemble of predictions produced using the same version of the model with varying initial conditions, thus allowing the relative uncertainties associated with natural variations and process uncertainties to be estimated.