Geophysical Research Abstracts, Vol. 7, 07862, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07862

Predicting changes in climate variability under increased carbon dioxide.

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The climate system is observed to vary over many time scales including annual to decadal. Recent trends noted in the observations of variability patterns such as the North Atlantic Oscillation (NAO) have suggested that climate change may affect the frequency and intensity of the phases of these different patterns. If this is the case, this would have very important impacts regionally on the types of weather we will experience under climate change. The observational data set is too short to determine whether such changes are long term, or part of the natural cycle. Long term runs of climate models allow us to investigate possible changes.

This research examines the changes in climate modes of the Northern hemisphere with a doubling of carbon dioxide concentrations for 600 year climate model integrations. Results show that the climate modes do not alter under climate change, but the amount of variability they explain does. As the climate modes have been shown to be a robust feature of the modelled climate system they have been used to examine the patterns of climate change. Predictions of future climate change patterns are limited by uncertainties from the models which are used; therefore an ensemble of predictions is required. To quantify the uncertainties from model parametrizations the Hadley Centre Quantifying Uncertainty in Model Prediction (QUMP) ensemble has been used.