

## **TRANSIENT CLIMATE CHANGE IN THE HADLEY CENTRE MODELS: THE ROLE OF PHYSICAL PROCESSES**

**K. D. Williams**, C. A. Senior and J. F. B. Mitchell

Hadley Centre for Climate Prediction and Research, The Met. Office, London Road, Bracknell, Berkshire, RG12 2SY, UK.

[kdwilliams@meto.gov.uk](mailto:kdwilliams@meto.gov.uk)/Fax: (44) 1344 854898

In order to improve predictions, there is a need to understand the dominant processes associated with climate change and how realistically they are simulated in climate models. By isolating the important feedbacks, an evaluation of these processes can take place.

We compare the transient response of two versions of the Hadley Centre's coupled atmosphere-ocean GCM, namely HadCM2 and HadCM3, to increasing GHGs and investigate the reasons for differences in that response. Through an understanding of the mechanisms of the differences, the realism (or otherwise) of feedbacks can be evaluated and therefore confidence in predictions improved. In order to identify the physical processes which have a large impact on the model's response, a series of sensitivity experiments have been conducted with a coupled atmosphere-mixed layer ocean model. Much of the different pattern of response results from changes to the boundary layer scheme combining in a non-linear way with changes to the cloud scheme to alter the tropical temperature and precipitation response in the model. The new land surface exchange scheme in HadCM3, largely accounts for the different northern hemisphere continental surface temperature response.