2012 Project Summary

Role of Atmospheric Internal Variability in the Atlantic Meridional Overturning Circulation

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Recent studies suggest that the primary (internal) source of predictability on decadal timescales in the North Atlantic is the Atlantic Meridional Overturning Circulation (AMOC). In many coupled climate models the AMOC exhibits decadal oscillations, although the time scale of these oscillations varies considerably among models. These oscillations, if they indeed exist in nature, can be considered as one possible physical basis for decadal climate prediction. However, there is as yet no clear understanding of the causes for the AMOC oscillations in either the models or observations. An issue highly pertinent to the understanding of decadal climate predictability and to the discussion of the role of oceans in climate change is whether the AMOC oscillations are sustained by air-sea feedbacks or maintained by atmospheric internal variability (AIV). We seek to explore how the mean strength and variability of the AMOC are affected by AIV, through what physical processes AIV exerts its influence on the AMOC, and what the role of AIV is in AMOC’s response to global climate change. We will address these issues through a systematic analysis of the relationship between AIV and AMOC using IPCC climate model output and observed data sets. The data analysis will further be complemented by a set of coupled climate model experiments where the influence of AIV on air-sea coupling will be altered through the use of a novel noise-filtering algorithm, called interactive ensemble (IE), developed by Kirtman and Shukla (2002).