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Impact of anomalous ocean heat transport on the North Atlantic Oscillation

F. D'Andrea (1), A. Czaja (2) and J. Marshall (2)
(1) LMD - Ecole Normale Superieure, Paris, (2) MIT - EAPS, Cambridge MA - USA

Coupled atmosphere-ocean dynamics in the North Atlantic is studied by means of a simple model, featuring a baroclinic three dimensional atmosphere coupled to a slab ocean. Anomalous oceanic heat transport due to wind driven circulation is parameterized in terms of a delayed response to the change in wind stress curl due to the North Atlantic oscillation (NAO). Climate variability for different strengths of ocean heat transport efficiency is analyzed. Two types of behavior are found depending on timescale. At interdecadal and longer timescales a negative feedback is found that leads to a reduction in the spectral power of the NAO. By greatly increasing the efficiency of heat transport, the NAO in the model can be made to completely vanish. At decadal timescales a coupled oscillation is found in which SST and geopotential height fields covary. The relevance of these phenomena to the observed climate is discussed.