Computer exercise
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1.. With the simple, 2 box, ocean thermohaline circulation model forced by varying atmospheric moisture transport (Matlab program THD2B2009.m)

a. Study the influence of the “wind –driven circulation” (WDC), parameterized here as horizontal mixing v, on the strength and stability of the thermohaline circulation (THC). For example take v =0 and 10 Sv (1 Sv = 10^6 m^3 s^{-1}) in addition to the standard case value of v = 5 Sv. How can this influence be understood?

b. How does ocean heat transport vary with the atmospheric moisture transport and with the strength of the WDC?

2. Address the following with the simple coupled atmosphere-ocean-sea ice model (Matlab program CClim2B2009p):

a. Study the sensitivity of model results to changing pCO2. How much do the atmospheric moisture transport, the ice edge latitude and the THC change? What is the behavior of ocean heat transport and why? What is the behavior of atmospheric heat transport and why?

b. What is the climate sensitivity for the standard case of this coupled model for a doubling of pCO_2? What is this sensitivity for halving pCO_2? How can any difference in these sensitivities be explained? (Hint: check how much of these sensitivities are due to the ice albedo feedback).

c. Remove the WDC from the model (by setting the flow parameter kwdc to zero in line 61) and rerun the model. Interpret any differences with respect to the standard case model run.

d. Put the WDC back in and change the model to a more climatically-sensitive setup (for example, take Ao=215 and B = 1.7; this returns the same global mean temperature of 15 C). Run the model for this new setup, compare the results with those of the old setup and interpret any differences.