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A simple model for the strength of the THC based on air-sea interactions

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In the absence of interior mixing, we show that consideration of geometric (i.e. northern land and sea versus a southern aqua planet) and thermodynamic (i.e. ΔT on ρ) effects allow a prediction of the strength of the thermohaline circulation (THC). The prediction is based upon the north/south asymmetry of air-sea interactions resulting from the warmer temperature of the isopycnal in the North Atlantic. The strength of the THC is defined as the light to dense surface water transformation in the North Atlantic.

The model is compared to a new climatology of observed air-sea transformation rates and transformation rates calculated from HadCM3. The new climatology revealed a positive surface transformation of $\sim$15Sv from light to dense water over the 1027 Kgm^{-3} isopycnal in the North Atlantic (due to cooling) which is balanced by an opposite surface transformation in the Southern Ocean (due to warming and precipitation). This north/south balance supports the adiabatic limit assumption made in the simple model.