Abstract View

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Influence of Southern Hemisphere Winds on North Atlantic Deep Water Flow

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ABSTRACT

A series of experiments with a hybrid model (ocean circulation model with simple atmospheric feedback model) and an ocean-only model is used to study the sensitivity of the ocean's deep overturning circulation to Southern Hemisphere winds. In particular, the "Drake Passage effect" is examined.

The results show that two factors weaken the control that the Drake Passage effect exerts over the flow of North Atlantic Deep Water (NADW). The first is that thermohaline forcing alone can generate about 75% of the NADW flow found in our model; this ability is lost if atmospheric feedback is neglected. The second is that about two-thirds of the downwelling induced by Ekman transport across Drake Passage occurs in the Southern Hemisphere just north of Drake Passage; only one-third occurs in the North Atlantic and enhances NADW flow. For these two reasons, the influence of Southern Ocean winds on NADW flow is only moderate and not as strong as previously suggested. However, the authors find that the formation rate of Antarctic Bottom Water depends strongly on the winds over the Southern Ocean.