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Are tracer distributions useful for evaluating heat uptake by the ocean?

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Under anthropogenic forcing we expect the net surface heat flux into the ocean to increase leading to an increase in ocean heat content. An increase in ocean heat content has been observed and also simulated by coupled climate models under anthropogenic forcing. We might expect that heat will enter the ocean along ventilation pathways such as those seen in CFC tracer distributions.

Here we describe results from an experiment with HadCM3 where CO_2 is increased at a rate of 2% per year for 80 years. In this experiment we introduced a passive anomaly tracer to track heat uptake whose boundary condition at the surface was the anomalous surface heat flux. We show that uptake of the passive anomaly tracer can be largely attributed to changes along isopycnals (or the ventilation pathways). Heat uptake however is largely attributed to heave (or movements of the isopycnals).