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Cause and effect of variations in the sinking of deep water in the MOC

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Interannual to decadal timescale variability of the MOC can be most efficiently studied by examining variations in its descending branch. Spall and Pickart recently showed that buoyancy forced downwelling is concentrated near lateral boundaries, and they also give testable scaling relations for the amount of downwelling.

We check these theories in the 1958-2001 hindcast by the global 0.25° eddy-permitting ocean model NEMO/OPA (DRAKKAR Group 2007), which uses a combination of historical atmospheric forcing fields from the NCEP and ECMWF reanalyses. 2-D patterns of downwelling on various density and z-levels are constructed, which confirm Spall and Pickart's sinking place theory. We also study the mass budget of the descending branch of the MOC across a few appropriate density surfaces, in order to establish a link between (boundary) sinking and deep convection, and to evaluate model simulations with respect to Spall's theoretically derived scaling relations.