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Model representation of salinity anomalies and the stability of the North Atlantic overturning circulation

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Vellinga and Wu (2004) and others have identified feedback cycles governing the decadal variability of the North Atlantic overturning circulation, in which modulation of tropical rainfall creates near-surface salinity anomalies that propagate northward to the winter convection regions, where they affect the wintertime convection through changes in surface density.
Freshwater "hosing" experiments, in which 0.1 Sv of extra freshwater is added to the convection region, are described using two climate models: the UK Met Office's HadCM3; and CHIME, which is identical to HadCM3 except for the replacement of the z-coordinate ocean component of HadCM3 with the hybrid isopycnic model HYCOM. While HadCM3 shows an unambiguous weakening of the meridional overturning circulation (MOC) by 5 Sv, the MOC in CHIME initially starts to decrease but returns to a value close to that in the control experiment after 40-50 years even though the hosing flux is still being applied.
It will be shown that the recovery of the overturning in CHIME is mainly due to enhanced advective transport of salt from the subtropics by salinity anomalies. These are found to be substantially more coherent meridionally in CHIME than in HadCM3, consistent with the known superior ability of the isopycnic model formulation to preserve watermass properties over long distances.