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Using dye tracers to understand the development of the T--S structure of the ocean thermocline

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Understanding what sets the T--S relation within the thermocline, and how long and what volume of ventilated waters in each T--S class stay in the sub-surface thermocline is a key question for climate prediction. In particular the sparsity of the T--S distribution has been a puzzle since the days of Stommel. Here we use runs performed for the TICTOC project, in which water is labelled by its year of ventilation and its source region, to understand how the volumetric T--S relation is laid down year on year, and evaluate the importance of near-surface (mostly vertical) mixing in the first year of ventilation against longer term mixing (much of which is isopycnal) in specifying the T--S distribution.