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Mixing in the tropical ocean

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Vertical mixing plays an important role in closing the overturning circulation of the sub-tropical cells. Where it occurs influences the water mass characteristics of the tropical ocean. A useful diagnostic, which will be presented here, is the distribution of the diapycnic velocity (the diapycnic component of the overturning circulation) which allows the pathways of transport to be thoroughly examined and which gives a very different picture to that implied by the Eulerian vertical velocity. The focus will be on the Eastern Tropical Pacific where the bulk of the upward diapycnic flux in the Pacific subtropical cells occurs and where mixing associated with the Equatorial Undercurrent, Tropical Instability Waves and coastal upwelling all contribute. Special emphasis will be placed on the need to study the impact of ocean mixing in the context of the fully coupled ocean/atmospere system. Changes to the level of the ocean vertical mixing affect the atmosphere through changes in SST which in turn can feedback to the ocean through the surface wind, precipitation and cloudiness. To illustrate the issue, increasing the vertical mixing in the coupled system produces a much larger change to SST than an ocean-only model, an increase in the strength of the EUC (as opposed to a decrease in an ocean-only model), and significant reductions in the NECC and height of the Costa Rica Dome. We need to go beyond stand alone ocean models in testing ocean mixing parameterization schemes.