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“Dispersion, Diffusion and Confusion: Lateral Mixing in the Ocean”

ABSTRACT: Lateral mixing in the ocean is remarkably poorly constrained. This talk will discuss the sources of this uncertainty and how it matters for the Earth System. Theoretical estimates of mixing tend to produce very large values in boundary current regions, but low values in the subtropical gyres. But direct measurements of dispersion in the gyres suggest values of mixing that, when applied in these theoretical models, would completely suppress the global overturning circulation. A more recent estimate of mixing is based on velocity fields estimated from satellite altimetry. Examination of the mixing coefficients produced by this estimate suggests that one reason that the theory and observations disagree is that the effects of waves and large-scale shear are often not treated properly in both frameworks. U!

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te of Earth System Models which compare this new parameterization against a range of constant coefficients, we show that changing the mixing coefficient has a huge impact on open-ocean hypoxia, significant impacts on El Nino and anthropogenic carbon uptake, but a relatively weak impact on climate sensitivity.