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Experiments on differential diffusion of temperature and salinity across a sheared density interface P. RYAN JACKSON, University of Illinois at Urbana-Champaign, CHRIS REHMANN, Iowa State University — Differential diffusion of two stably stratified scalars with different molecular diffusivities in a turbulent flow can affect ocean circulation modeling and the interpretation of ocean mixing experiments. In past work we used rapid distortion theory to evaluate the effect of a mean shear on differential diffusion. The present work compares those theoretical results with results from laboratory experiments. In the experiments, an Odell-Kovasnay recirculating flume and disk pump was used to drive a warm, fresh water upper layer over the cold, salty quiescent lower layer. Bulk measurements based on the evolution of the scalar profiles and instantaneous interfacial flux measurements were employed to quantify scalar mixing across the sheared interface. Results from the experiments compare well with predictions of the theory. For weakly turbulent, strongly stratified flows, differential diffusion is found to decrease with increasing shear. However, for more energetic flows, differential diffusion is found to increase with increasing shear.

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