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Towards an accurate parameterization of mixed layer deepening during ocean convection TAIMOOR SOHAIL, The Australian National University, BISHAKHDATTA GAYEN, The University of Melbourne, ANDREW HOGG, The Australian National University — We investigate the growth and equilibrium of the oceanic mixed layer during a deep convective event using a Direct Numerical Simulation (DNS) and a large-scale ocean model. The DNS resolves all scales of flow, providing the opportunity to quantify vertical buoyancy flux and mixing in a deep convective event. The inferred vertical diffusivity and mixed layer depth (MLD) are simulated over a range of background stratifications and surface buoyancy forcings in the DNS model. A scaling theory for convective mixing is proposed which robustly predicts the rate of MLD growth and vertical diffusivity during deep convection. We directly compare the MLD predicted from the scaling theory with existing vertical parameterizations in a large-scale ocean model. Specifically, we run analogous deep convection experiments with the Modular Ocean Model (MOM) 6 running three different vertical parameterizations for the ocean boundary layer: CVMix, KPP and ePBL. We quantify the difference between the MLD derived from these parameterization schemes and the predictions from the theoretical scaling, thereby quantifying the accuracy of existing parameterization schemes.

Taimoor Sohail
The Australian National University

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