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Towards a Subgrid Model of Planetary Boundary Layers Based on Direct Statistical Simulation[1] JOSEPH SKITKA, BAYLOR FOX-KEMPER, BRAD MARSTON, Brown University — Reliable weather and climate modeling requires the accurate simulation of Earth's oceanic and atmospheric boundary layers. However, long duration turbulence-resolving simulation is centuries beyond the reach of present day computers, hence subgrid modeling is required. Direct statistical simulation (DSS) that is based upon expansion in equal-time cumulants offers the prospect of building improved subgrid schemes. In contrast to other earlier statistical approaches, DSS makes no unphysical assumptions about the homogeneity, isotropy, or locality of correlations. We investigate the feasibility of a second-order closure (CE2) by performing simulations of the ocean boundary layer in a quasi-linear approximation for which CE2 is exact. Wind-driven Langmuir turbulence and thermal convection are studied by comparison of the quasi-linear and fully nonlinear statistics. We also investigate whether or not basis reduction can be achieved by proper orthogonal decomposition (POD) of the second cumulant.

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