Abstract Submitted
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Direct numerical simulation of stationary homogeneous moist turbulence DANIEL CHUNG, University of Melbourne, GEORGIOS MATHEOU, Jet Propulsion Laboratory California Institute of Technology — Direct numerical simulation is reported of stationary and homogeneous, buoyancy-driven turbulence in moist air. Moist-air dynamics is more complex than its dry-air counterpart because of the possibility of latent-heat release during condensation or latent-heat absorption during evaporation. These phase changes depend on the local fluid composition and alters the buoyancy in a non-trivial way. In this study, moist air is modeled using equilibrium thermodynamics and the continuum approach in which the effect of phase changes is manifested through a nonlinear dependence of buoyancy upon the mixture fraction. A large-scale forcing is imposed on the the mixture-fraction equation to model the engulfing action of large eddies. This flow represents an idealisation of subgrid-scale moist processes that occur in the simulation of clouds, and is a first step toward improving subgrid condensation schemes. Statistics from this flow, including cloud fraction, mean liquid water content and subgrid buoyancy flux, will be compared with the predictions of the commonly used Sommeria and Deardorff (1977) scheme.

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