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A Precipitating Moist Rayleigh-Bnard Convection Model[1] HAO FU, YIHUA LIN, Institute of Atmospheric Physics, Chinese Academy of Sciences — In order to derive a simple atmospheric moist convection model, the classical Rayleigh-Bnard convection model has been extended to include water phase change by Bretherton (1986) and Pauluis (2010). The stratification is conditionally unstable, with statically unstable saturated region and stable unsaturated region. We derived a simple precipitation scheme from basic thermodynamic principle, with three additional non-dimensional parameters characterizing rain formation time scale, rain fall speed and rain evaporation time scale. A Boussinesq CFD code in vorticity-velocity formation was developed to solve the equation set. In a thermal bubble simulation which resembles isolated convective storm, the precipitation cold pool and density current has been successfully reproduced. The model is further used to simulate free moist convection whose non-precipitating counterpart has been done by Pauluis (2011). Self-aggregated convection has been reproduced and the effect of evaporation-induced density current on convection lifecycle will be discussed.

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