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Continuous evolution of cloud droplet spectrum in cumulus cloud[1] TOSHIYUKI GOTOH, IZUMI SAITO, TAKESHI WATANABE, Nagoya Institute of Technology — We have developed a new method that can seamlessly simulate the continuous growth of cloud droplets to rain drops from the first principle. A cubic box ascending with a mean updraft was introduced and the updraft velocity was self-consistently determined in such a way that the mean turbulent velocity within the box vanished. All the degrees of freedom were numerically integrated by using the Lagrangian dynamics for the droplets and the Eulerian direct numerical simulation for the turbulence. The key processes included were turbulent transport, condensation/evaporation, Reynolds number dependent drag, collision-coalescence, and entrainment. We have examined the evolution of the droplet spectrum over 400 s for a few of the initial droplet spectra: (1) single peak, (2) double peaks, (3) observed distribution, each of which had the same initial mean radius 10μm and the same mean droplet density $n_p = 125$ cm^{-3}. The turbulence was in steady state at $R_\lambda = 86$ and $\epsilon = 33$ cm^{2}s^{-3}. It is found that the mass spectrum peak moves slowly toward the larger radius in the early stage and then quickly evolves to have the second peak through the autoconversion to the accretion state. Effects of the condensation and coalescence would also be reported.

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