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Numerical simulation of cloud droplets and turbulence[1] TOSHIYUKI GOTOH, IZUMI SAITO, TAKESHI WATANABE, TATSUYA YASUDA, Nagoya Inst of Tech — We have developed a numerical simulation code, CMS (Cloud Microphysics Simulator), to compute growth of the cloud droplets and turbulent flow and their interaction from the microscopic viewpoint. The evolution of the droplet spectrum was successfully computed from the single peak to emergence of the second peak showing the rain drop formation. Applying this code we have studied the effects of the number density and of turbulent fluctuations on the spectral broadening in the condensation process. It is found that the spectrum peak shifts smaller side and the width becomes narrower with the increase of the number density, in agreement with the experimental data of the turbulence-cloud chamber at Michigan Tech. One illuminating aspect of the CMS study is that in addition to the droplet statistics a large amount of turbulence data is obtained. One finding is that the variance spectra of the temperature and water vapor mixing ratio begins to deviate from the turbulence spectrum like $k^{-5/3}e^{-\alpha k\eta}$ at high wavenumbers and the modification propagates toward low wavenumbers with time. We study this modification by using a large scale simulation with simple model for scalar carried by particles and explore the physical explanation from the turbulence theory.

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