

Development of a physically-based parameterization of the raindrop formation processes through machine-learning

Azusa Takeishi, Chien Wang

While quick transformations of cloud droplets into raindrops are frequently observed, reproducing such fast conversions in atmospheric models has been one of the major challenges. Recently some studies showed the importance of turbulences in expediting the cloud-droplets-to-raindrop process. In addition, it has long been argued that aerosol size distributions and chemical compositions may be critical to the collision-coalescence process. In this study, we utilize a parcel model that calculates the processes of aerosol activation, condensational growth, and collision-coalescence, all based on physical equations. We apply machine-learning algorithms to model-simulated raindrop mass alongside ten dynamical and microphysical variables as input features. Differences between the machine-learned results and those predicted by empirical parameterizations, as well as the applicability of the machine-learning-based parameterization in a regional model, will be discussed.