4.025 Effects of aerosols on the precipitation of convective clouds: a case study in the Yangtze River Delta.

Early Career Scientist

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Abstract:

Using the Weather Research and Forecasting model with Chemistry (WRF-Chem) and changing different levels of emissions (original, 50%, 10% and 1%), we simulate a typical convective precipitation to evaluate the effect of aerosols on precipitation. In general, the differences are most obvious in 100%-case, with the strongest precipitation center of 39 mm/h cumulative rainfall at 12:00 on June 10^{th} 2017. Furthermore, there was no clear evidence how many aerosols will promote or suppress precipitation, which is a nonlinear relation. All these results indicate that aerosols can change the microphysical process in the cloud and the structure of the convective cloud. In 100%-case, aerosols increase the rising velocity area and cloud water mixing ratio, but convection center is relatively weak. Accompanied by more CCN activation, the rest CCN number concentration at the height of the cloud is lower along with more ground precipitation. Evidence from the precipitation process of convective clouds indicates the excessive aerosols can produce more CCN, produce a large area and weak strength precipitation. To consider different microphysical processes, the production rate for accretion of rain by snow (PRACS) always keeps a high level. We need further develop microphysics schemes in order to more accurately predict the timing, distribution, and intensity of such an extreme event.