Atmospheric
Chemistry
and Physics

Supplement of

The effects of cloud–aerosol interaction complexity on simulations of pre-summer rainfall over southern China

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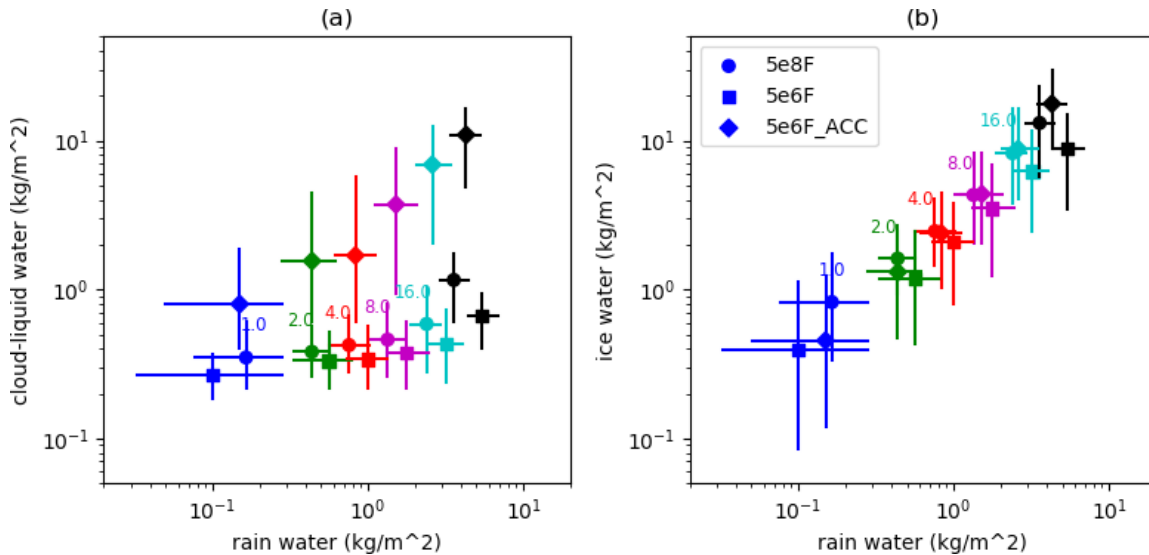*Correspondence to:* Yali Luo (ylluo@cma.gov.cn)

Figure S1. The scaling of (a) cloud-droplet liquid water path, (b) ice water path (snow and ice crystals), with rain water path, partitioned according to surface rainfall rate. The different symbols (circles, squares, etc.) denote different model experiments (5e8F, 5e6F and 5e6F_ACC) according to the key shown on the right. The colors correspond to logarithmic spaced surface rainfall intervals, the upper bound of each interval is indicated by the colored text on the plots (e.g, the red-colored points correspond to grid points where the rain rate was between 2 and 4 mm/h). The black points are for all rain rates greater that 16 mm/h. The horizontal and vertical bars show the inter-quartile ranges in each interval for the ordinate and coordinate variables.

Supplementary Material

Section 3.1.3(S). *The effects of ice- and mixed-phase processes on condensed-water paths*

Figure S1 shows the relationships between cloud-liquid-, rain- and ice-water paths for the 5e8F, 5e6F and 5e6F_ACC experiments. In 5e6F_ACC the aerosol-number concentration is the same as in 5e6F, but warm-rain processes (auto-conversion and accretion) have been switched off when the temperature is warmer than -4°C. Note that Fig. S1(b) shows that 5e6F_ACC is more similar to the 'polluted' simulation, 5e8F, than it is to the cleaner 5e6F. This suggests that, without warm-rain processes, the response of the system to aerosol perturbations is significantly smaller than would otherwise be the case. Figure S1(a) shows the liquid-water paths in the simulations; note that, although 5e6F_ACC has much larger liquid-water paths than the other two experiments (because there is no loss of cloud-liquid by warm-rain processes), the rain-water paths in 5e6F_ACC resemble those in the more polluted 5e8F simulation.