

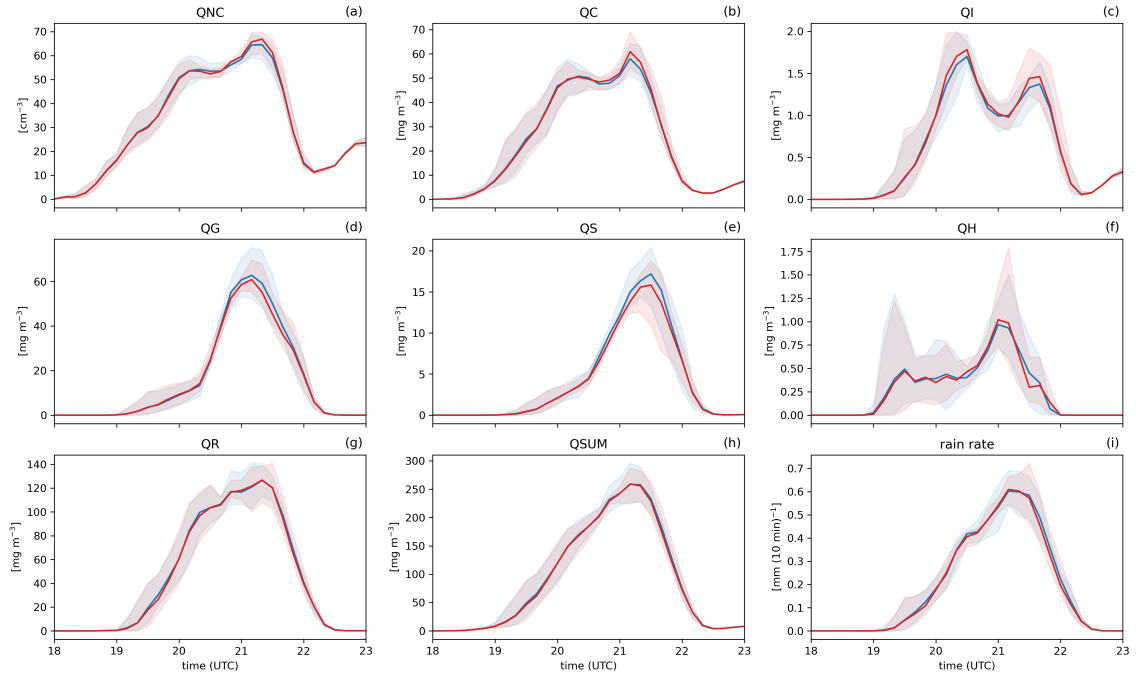


Figure S1. Box-averaged ($15 \times 15 \text{ km}^2$) and layer-thickness-weighted vertical averages (0 – 13 km) time series of (a) activated cloud droplet number concentration (QNC), (b) cloud water (QC), (c) cloud ice (QI), (d) graupel (QG), (e) snow (QS), (f) hail (QH), (g) rain (QR), (h) total cloud condensate (water, ice, snow, graupel, rain, and hail; QSUM), (i) shows box-averaged rain rate for Case I. Lines indicate the ensemble mean, while shading represents the ensemble minimum–maximum range. Blue lines correspond to the BASE experiment, red to the NONURBAN experiment.

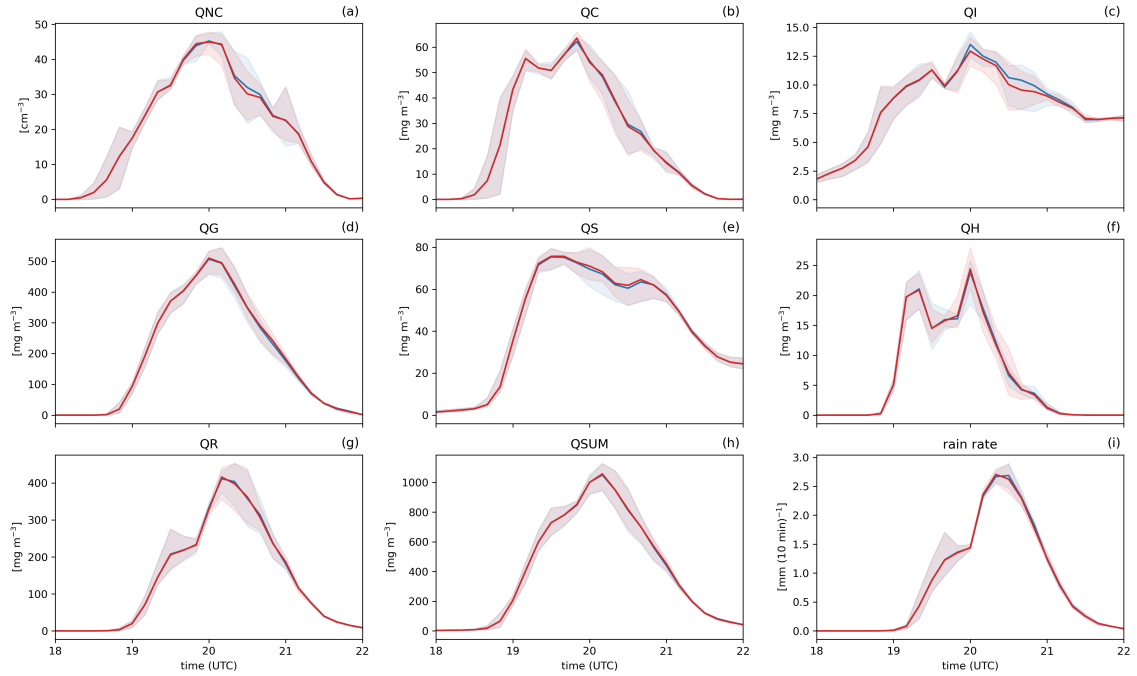


Figure S2. Box-averaged ($35 \times 35 \text{ km}^2$) and layer-thickness-weighted vertical averages (0 – 13 km) time series of (a) activated cloud droplet number concentration (QNC), (b) cloud water (QC), (c) cloud ice (QI), (d) graupel (QG), (e) snow (QS), (f) hail (QH), (g) rain (QR), (h) total cloud condensate (water, ice, snow, graupel, rain, and hail; QSUM), (i) shows box-averaged rain rate for Case II. Lines indicate the ensemble mean, while shading represents the ensemble minimum–maximum range. Blue lines correspond to the BASE experiment, red to the NONURBAN experiment.

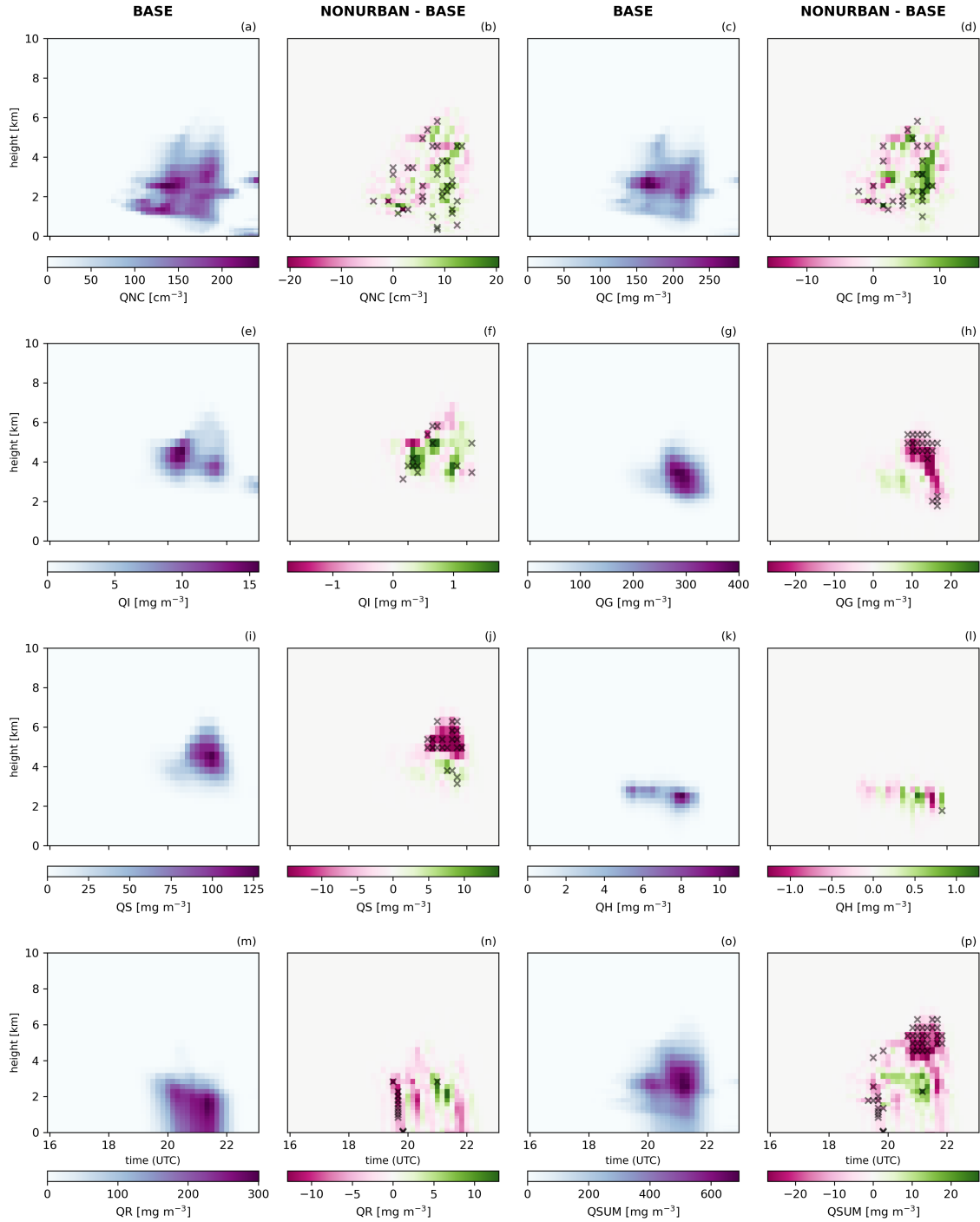


Figure S3. Box spatially averaged vertical profiles of cloud microphysical variables from the ensemble simulations for Case I. The left column of each pair shows the ensemble mean of the BASE simulation, while the right column shows the difference between the NONURBAN and BASE simulations. Variables include cloud droplet number concentration (QNC), cloud water (QC), cloud ice (QI), graupel (QG), snow (QS), hail (QH), rain (QR), and the sum of all hydrometeors (QSUM). Black crosses indicate levels where the differences are statistically significant at the 90 % confidence level.

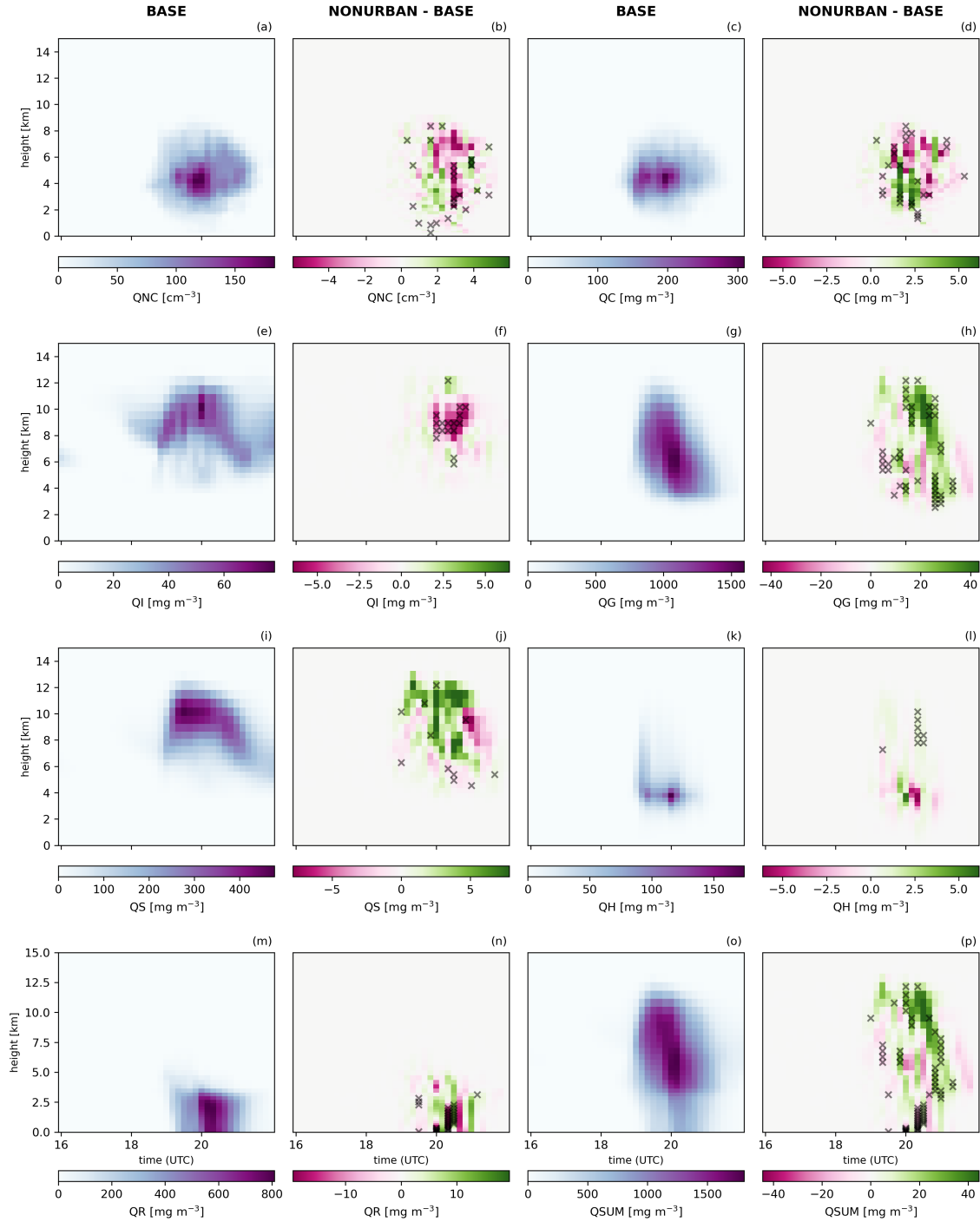


Figure S4. Box spatially averaged vertical profiles of cloud microphysical variables from the ensemble simulations for Case II. The left column of each pair shows the ensemble mean of the BASE simulation, while the right column shows the difference between the NONURBAN and BASE simulations. Variables include cloud droplet number concentration (QNC), cloud water (QC), cloud ice (QI), graupel (QG), snow (QS), hail (QH), rain (QR), and the sum of all hydrometeors (QSUM). Black crosses indicate levels where the differences are statistically significant at the 90 % confidence level.