Supplement of

Building a comprehensive library of observed Lagrangian trajectories for testing modeled cloud evolution, aerosol-cloud interactions, and marine cloud brightening

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a)

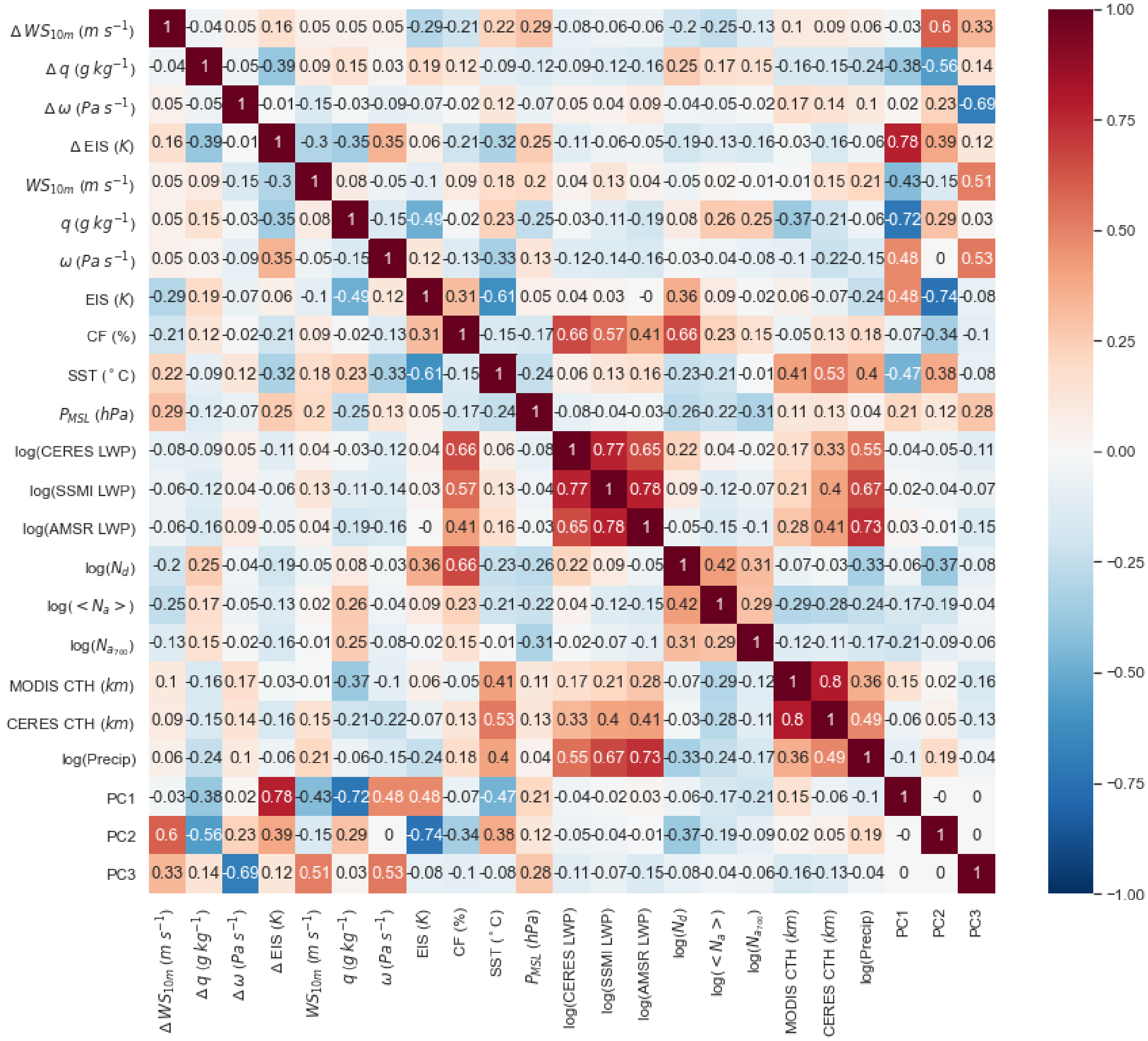


Figure S1. Pearson correlation coefficients (R-values) between various CCFs, cloud variables, and the first three PCs based on 1663 trajectories in JJA 2018-2021 used in this study. Note that only the first (top-most) 8 variables from the left side of the x-axis are used as inputs of PCA. The use of a Δ symbol before a variable means that the difference between the value of that variable at the beginning versus the end of the trajectory is calculated. Otherwise, the along-trajectory means are calculated.

b)

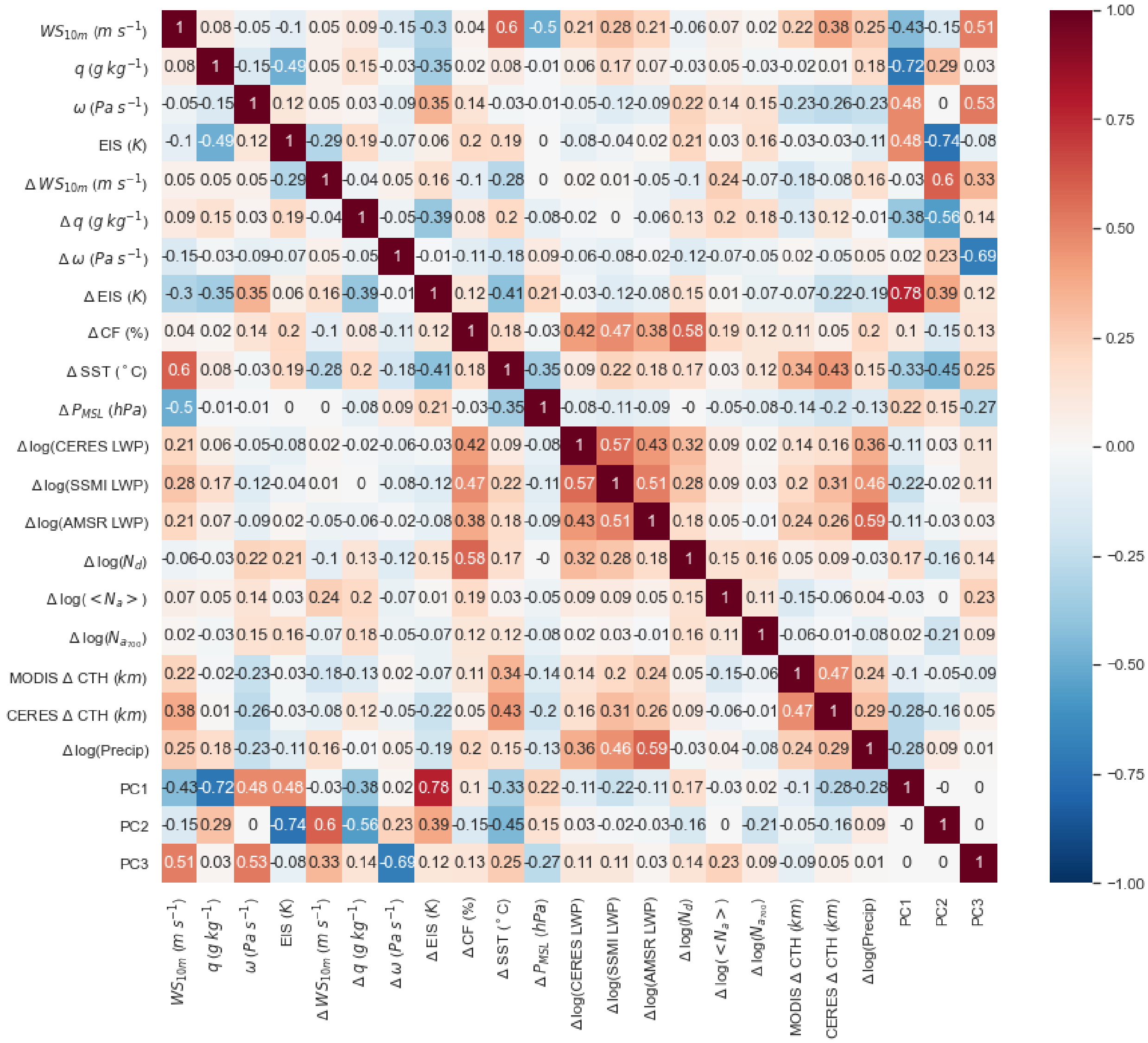


Figure S1. Continued.

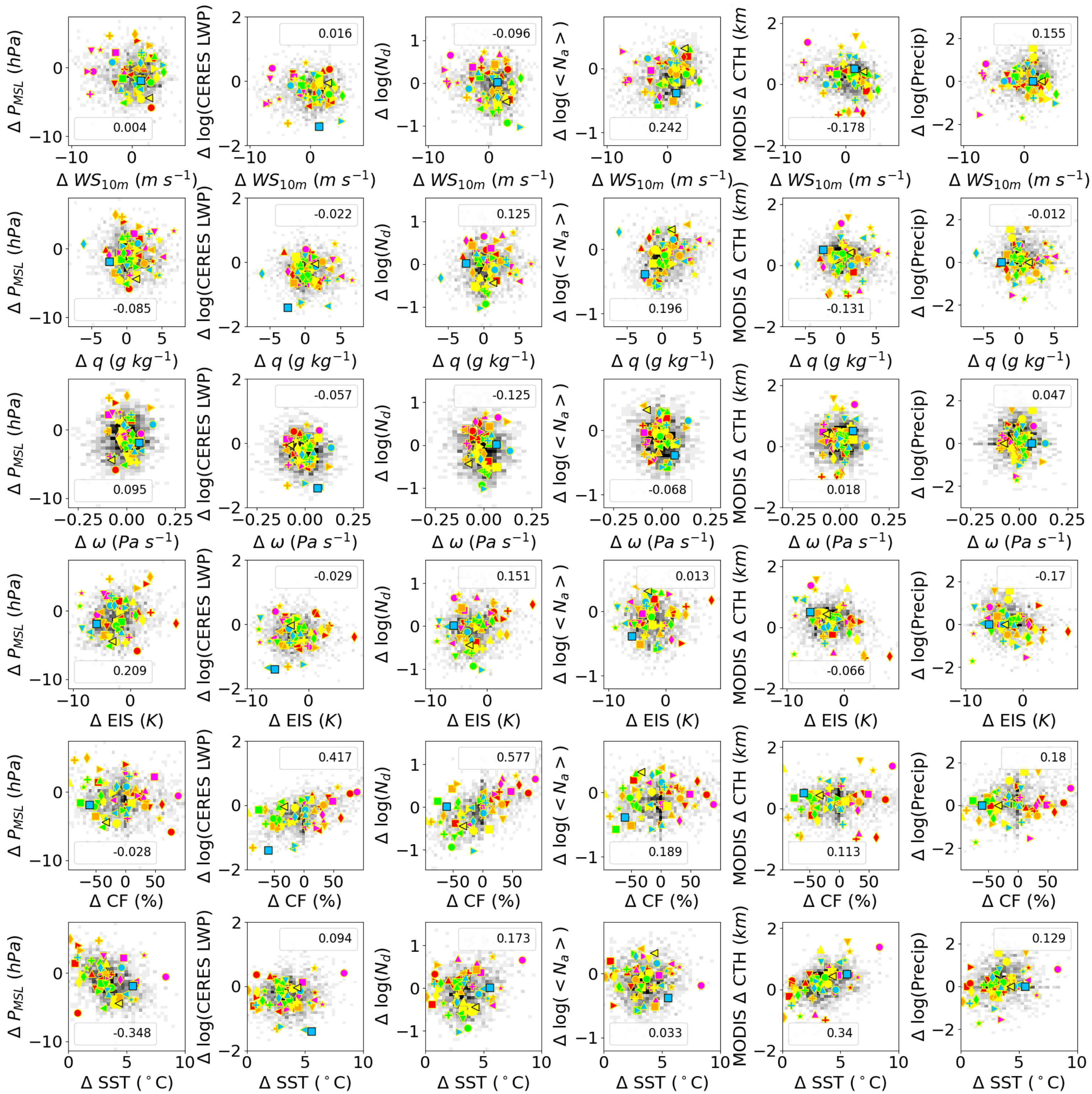
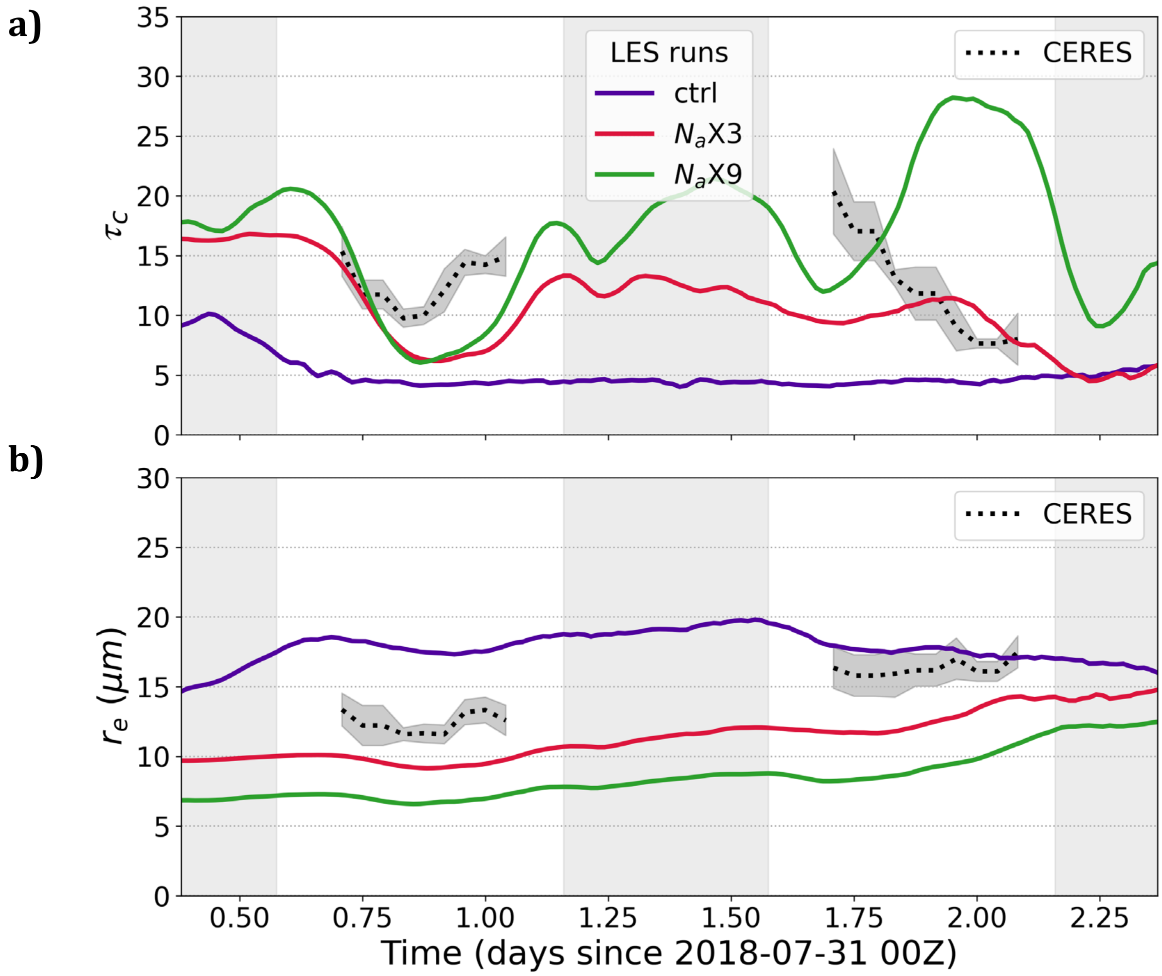
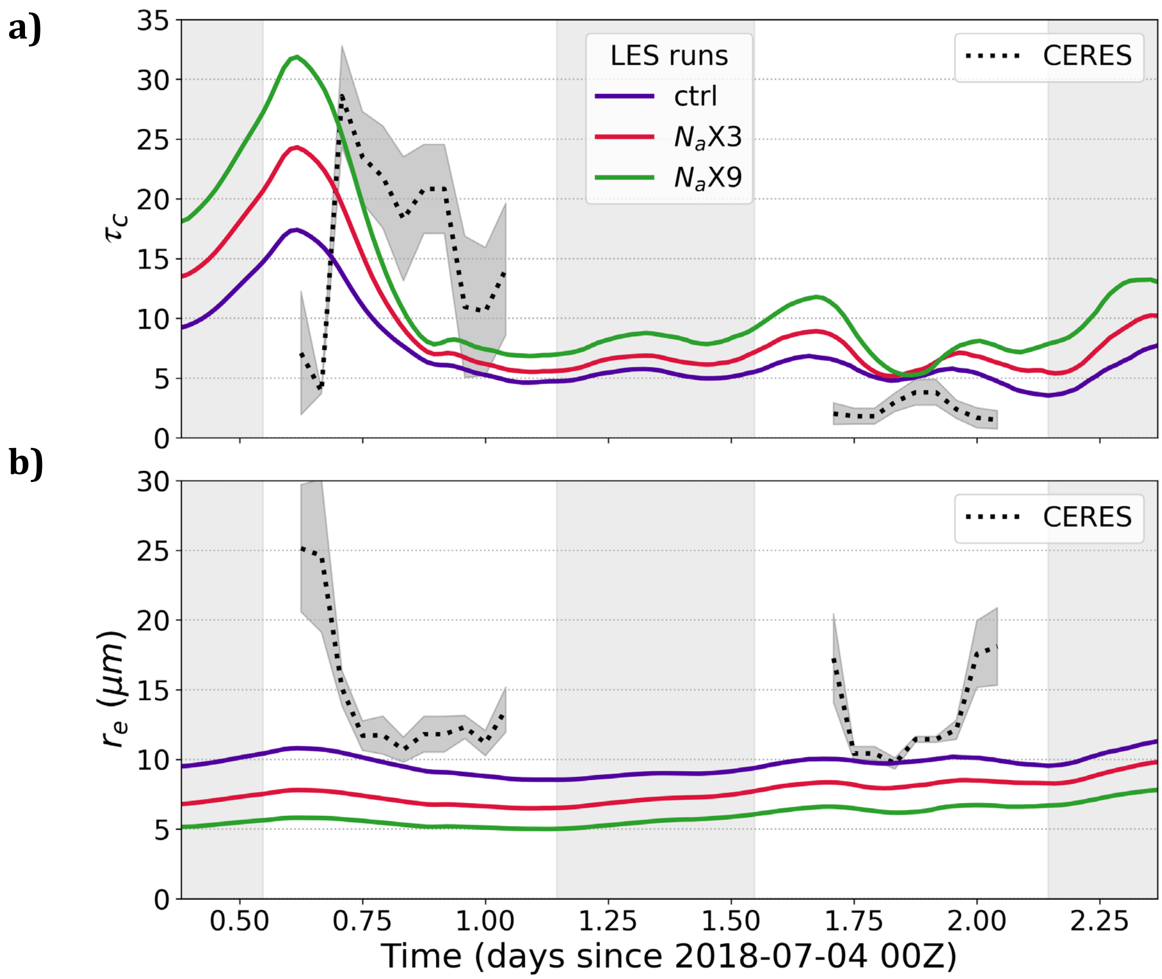


Figure S2. As in Figure 4b, but each panel shows differences between the beginning and end of the trajectories for a pair of variables.



35 Figure S3. As in Figure 5, but for cloud optical depth (τ_c) and cloud droplet effective radius (r_e).



40 Figure S4. As in Figure S3, but for the Sandu 2010 (2018-07-04) trajectory.

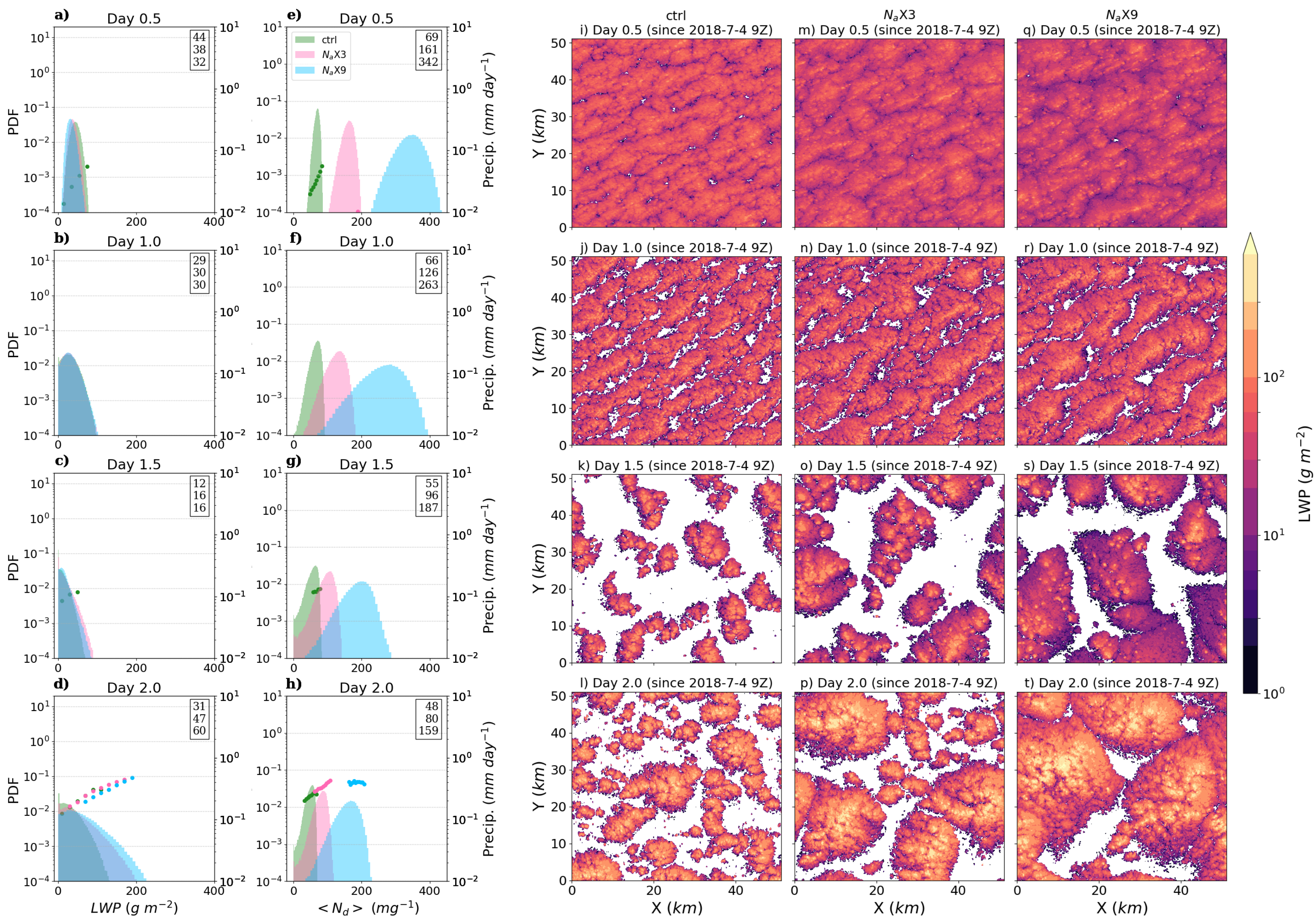


Figure S5. As in Figure 7, but for the Sandu 2010 (2018-07-04) trajectory.

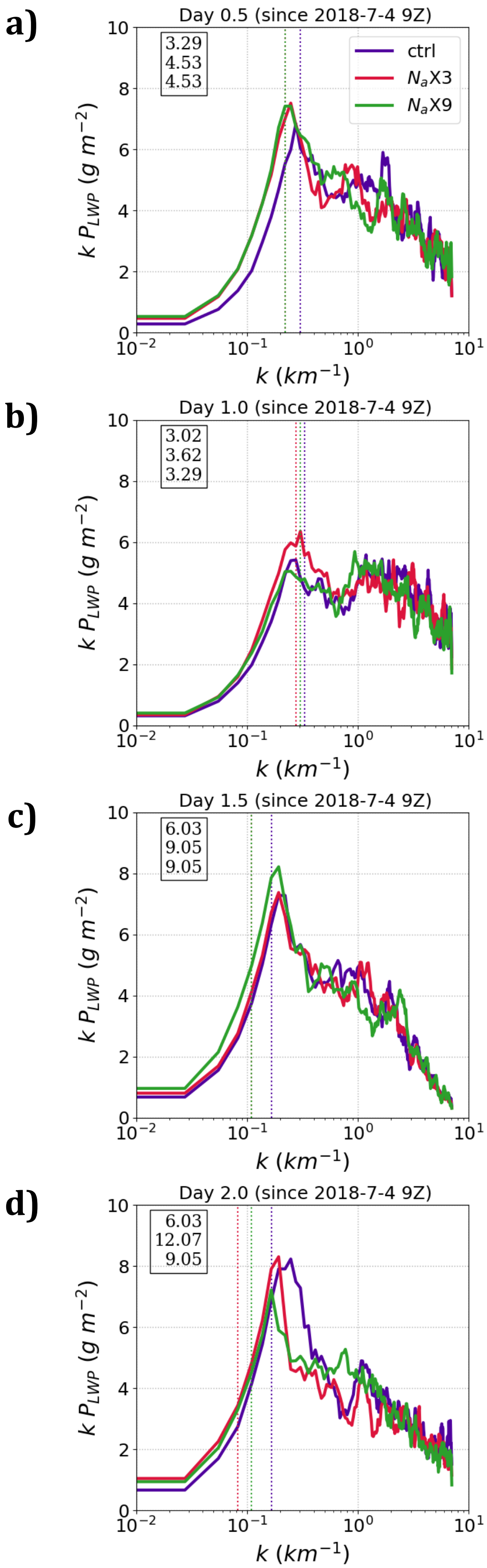


Figure S6. Variance spectrum for the LWP (solid lines) at four instantaneous times for three LES simulations (ctrl, N_a×3, N_a×9) along the Sandu 2010 (2018-07-04) trajectory. k is the wavenumber and P_{LWP} is the power spectrum for LWP calculated using Fast Fourier Transform (FFT). The LWP variance (σ_{LWP}) can be calculated as: $\sigma_{LWP} = \int_0^\infty P_{LWP} dk$. The critical wavenumber (k_c) is the wavenumber above which 2/3 of the total LWP variance is contained (dotted lines). The length scale (l) is then defined as: $l = 1/k_c$. The values of l are provided within the box in each panel (from top to bottom for ctrl, N_a×3, and N_a×9, respectively). See de Roode et al. (2004) for a detailed description of the methodology to quantify the length scale.