Supplementary Materials

Strong aerosol indirect radiative effect from dynamic-driven diurnal variations of cloud water adjustments

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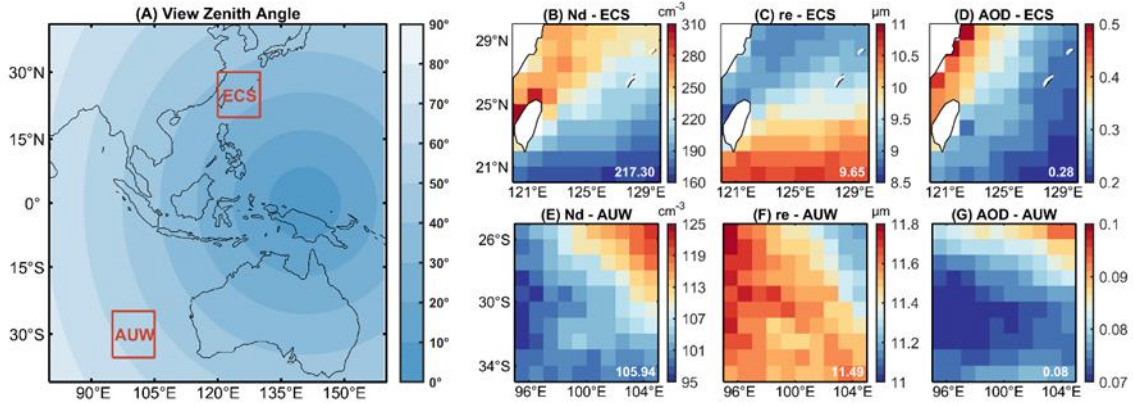


Figure S1. Distributions of cloud properties in two typical regions (the east China sea (20º-30ºN, 120º-130ºE, ECS) and the west of Australia (25º-35ºS, 95º-105ºE, AUW). (A) Geographical distribution of the view zenith angle of Satellite Cloud and Radiation Property retrieval System (SatCORPS) Himawari-8 data. The selected regions are marked by red boxes. Spatial distributions of cloud droplet number concentration (N_d) (B, E), effective radius (r_e) (C, F) and aerosol optical depth (AOD) (D, G) from MERRA-2 data are presented. The numbers in the lower right corner represent regional averages being weighted by the cosine of latitude.

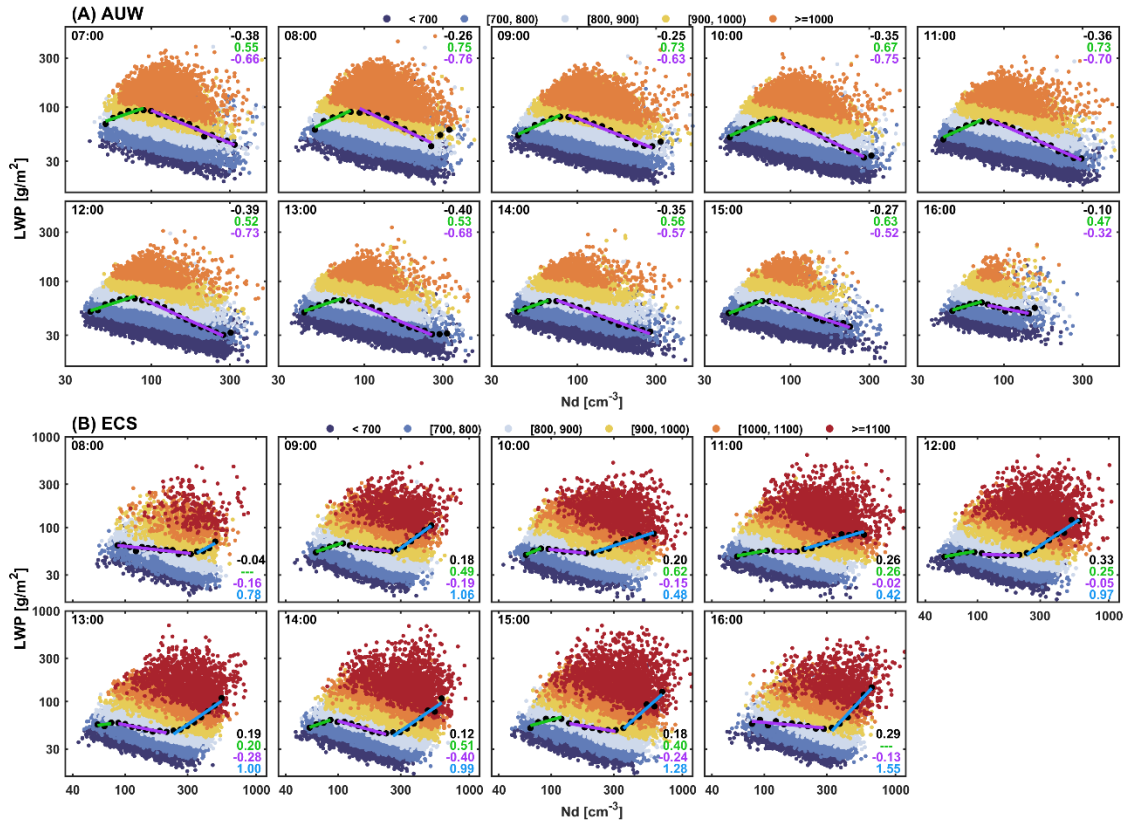



Figure S2. The complete diurnal pictures of LWP adjustments in AUW (A) and ECS (B) region. Colored dots are samples in different cloud thickness (H) bins (unit: m). Black dots represent median LWP in each Nd bin. The colored lines are the fits of black dots at different Nd stages, with values showed in corresponding color. The black number means the fitted value of all the black dots. Stages represented by green lines are aerosol-limited state dominated by the warm invigoration process. Purple lines are the stages dominated by the entrainment process. Blue line in (B) is another stage when the cloud invigoration effect by condensation exceeds the cloud suppression effect by entrainment. The fitted value for each stage is labeled with corresponding colors.

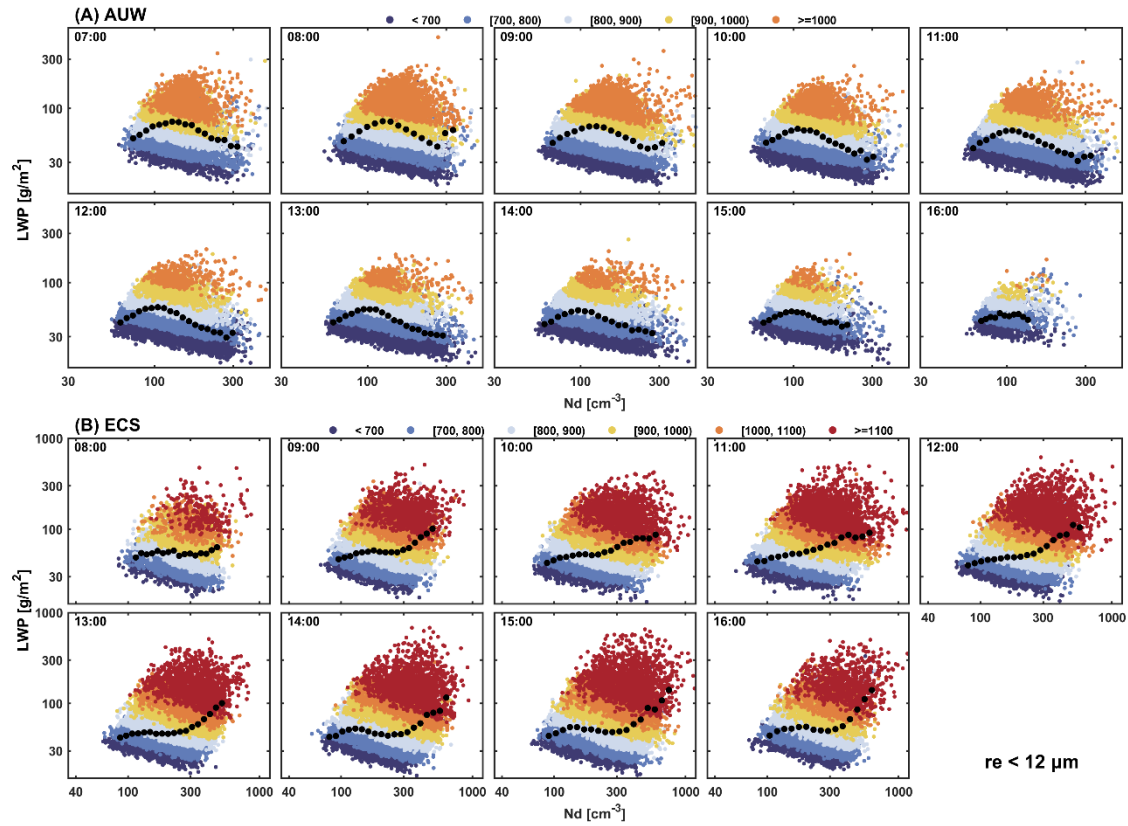



Figure S3. The complete diurnal pictures of LWP adjustments in AUW (A) and ECS (B) region with the precipitation threshold of $r_e < 12$ μm and GPM_3IMERGHH precipitation rate equals 0 mm/hr.

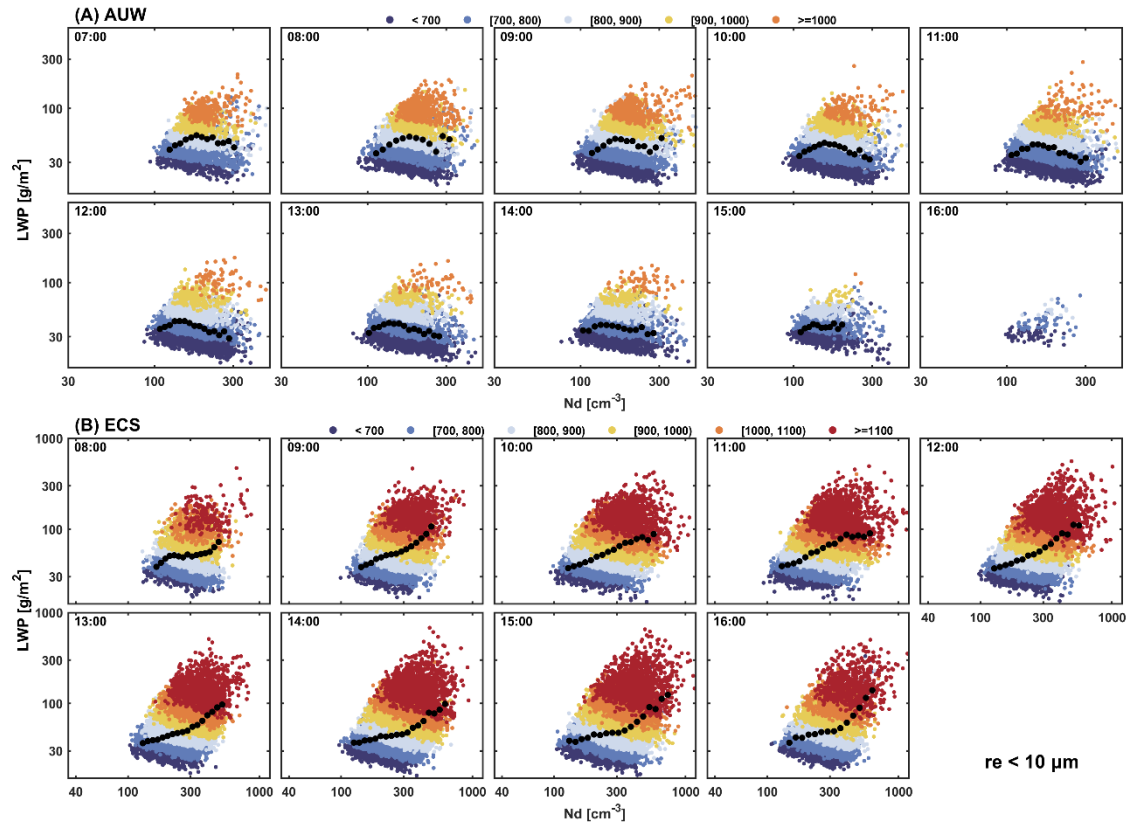



Figure S4. The complete diurnal pictures of LWP adjustments in AUW (A) and ECS (B) region with the precipitation threshold of $r_e < 10$ μm and GPM_3IMERGHH precipitation rate equals 0 mm/hr.

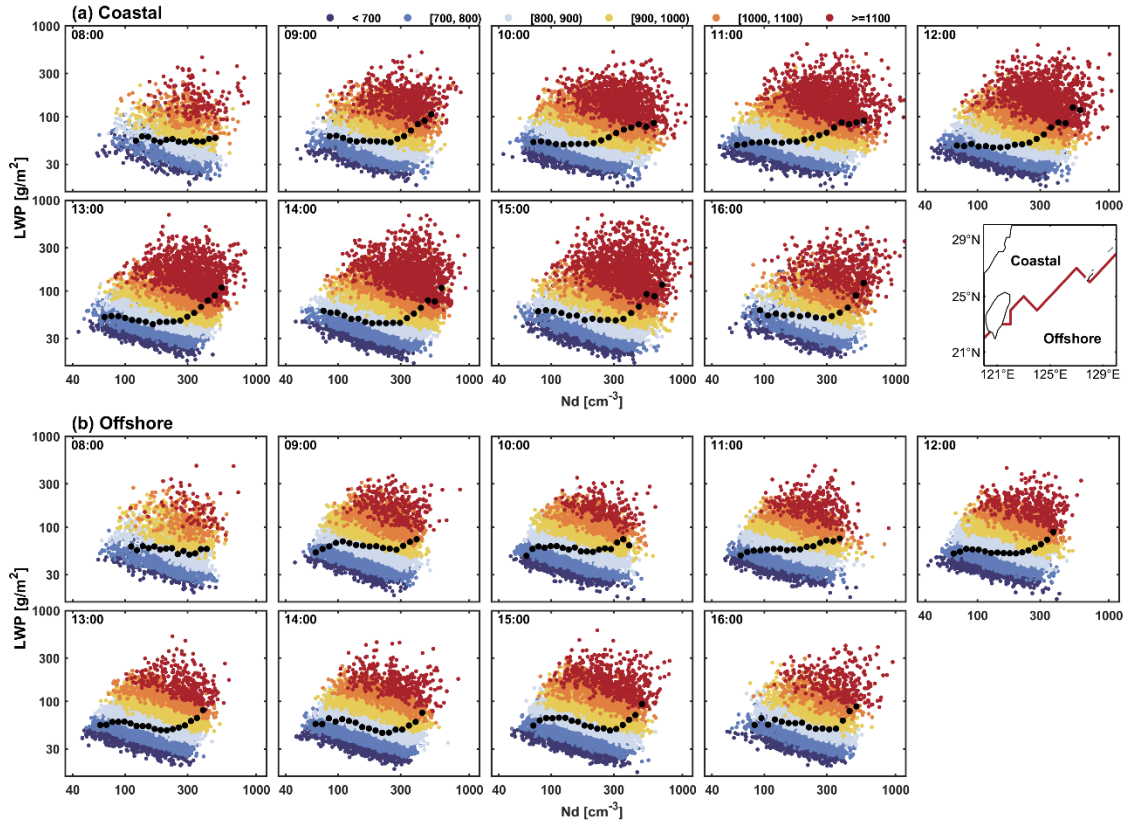



Figure S5. The complete diurnal pictures of LWP adjustments in coastal (A) and offshore (B) areas. The boundary of two areas are divided by the distribution of N_d in Figure 1. The coastal area is the area with 4-year averaged N_d lager than 220 cm^{-3} and the offshore area is the area with 4-year averaged N_d less than 220 cm^{-3}.

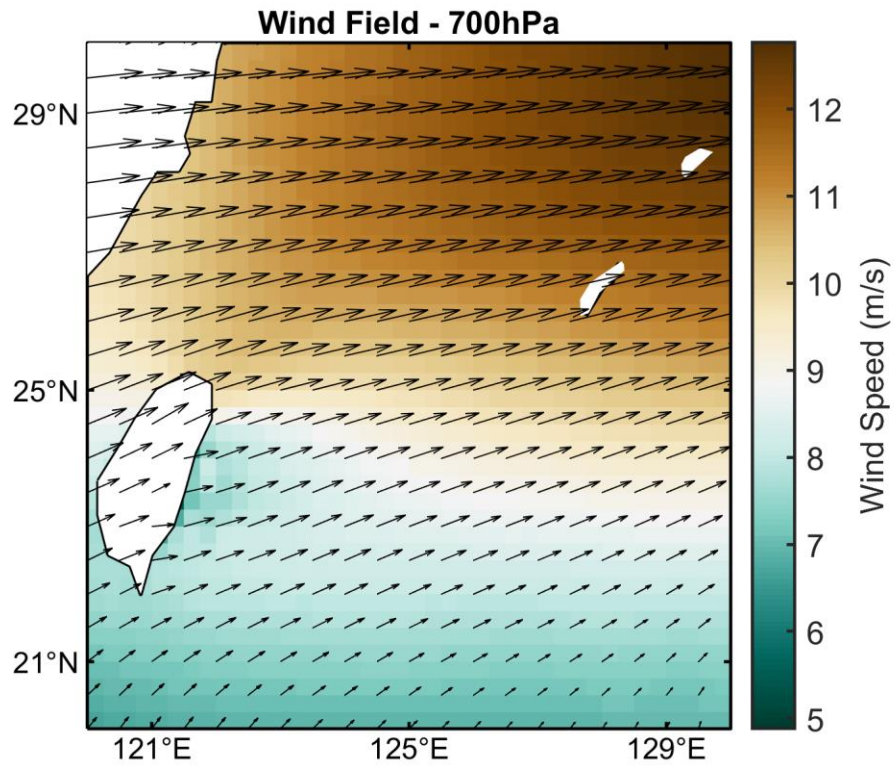



Figure S6. Horizontal wind field at 700 hPa in ECS region.

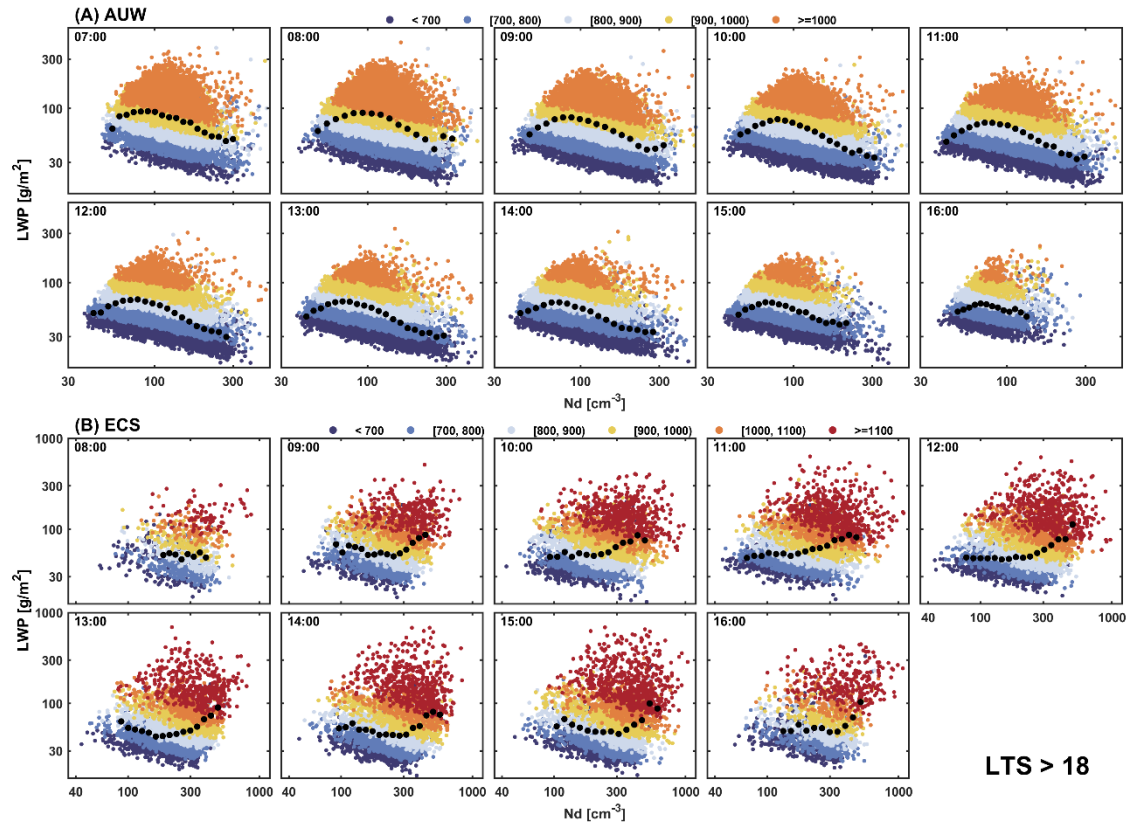
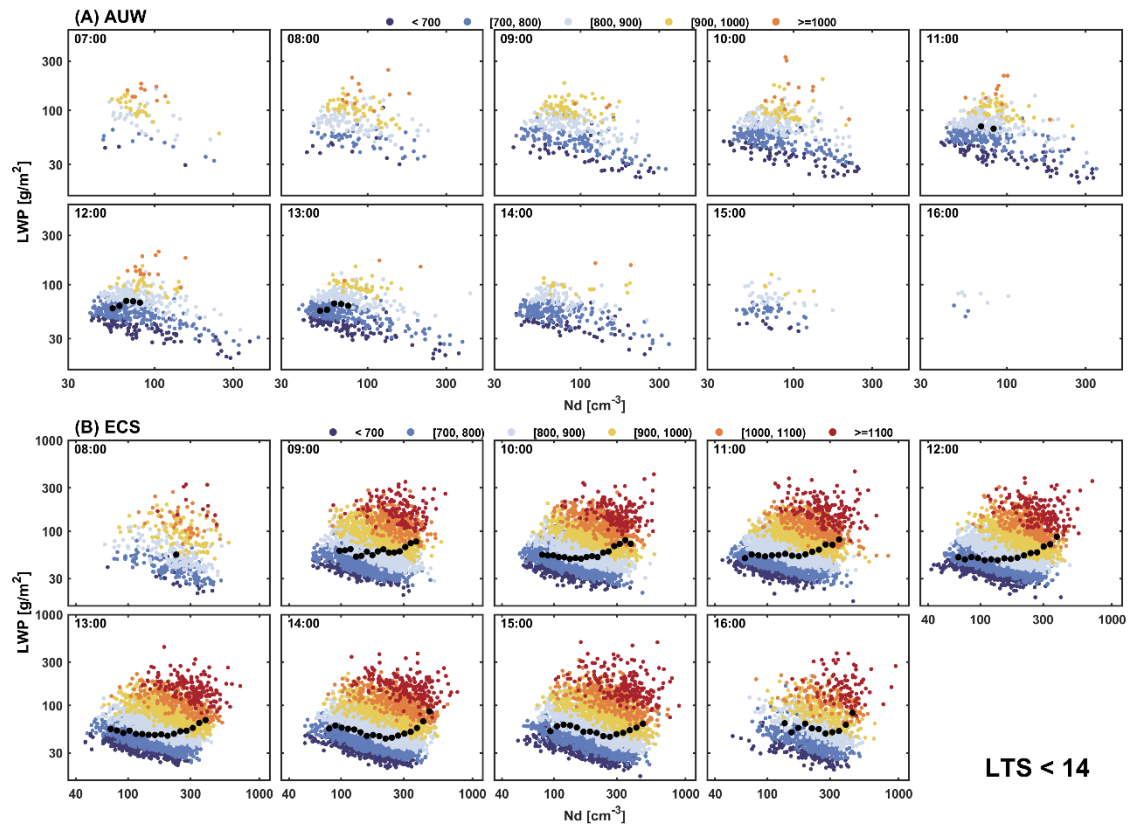



Figure S7. The complete diurnal pictures of LWP adjustments in AUW (A) and ECS (B) region with the samples of Sc clouds (LTS > 18 K).

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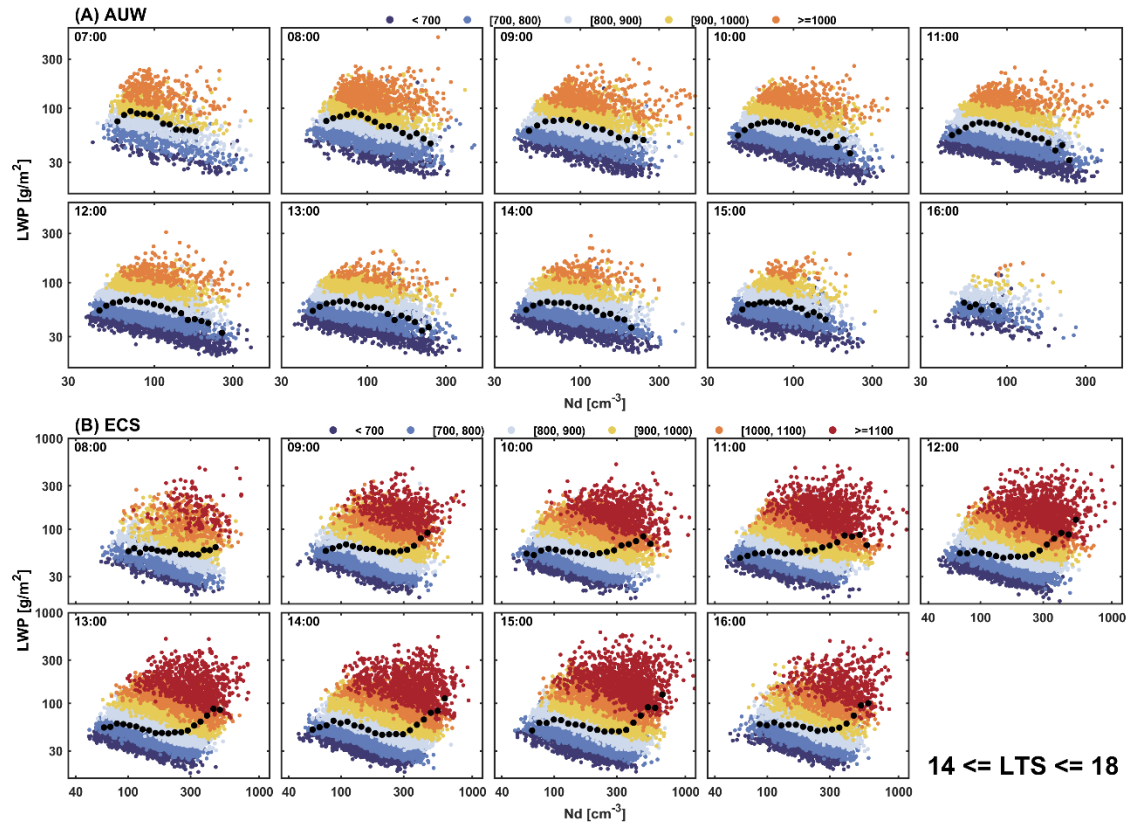
Figure S9. The complete diurnal pictures of LWP adjustments in AUW (A) and ECS (B) region with the samples of Sc to Cu transition regime (14 K <= LTS <= 18 K).