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Aerosol and cloud properties over a coastal area from aircraft observations in Zhejiang, China

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Using in-situ aircraft observations from six flights over Zhejiang on Sep. 1 and Sep. 4, 2016, this study investigates differences in aerosol and cloud properties between daytime and nighttime. The samples were divided into marine type and continental type based on the backward air mass trajectories and aerosol characteristics. The results show that the aerosol number concentration (N_a) near the ground during daytime is higher than that at nighttime. During daytime, N_a has a significant decreasing trend near the top of the planetary boundary layer (PBL), which is not obvious during nighttime. There may be still a relative high concentration of aerosols remaining in the transition zone between the PBL and the free troposphere. Under similar liquid water content (LWC) conditions, the cloud droplet number concentration (N_c) at night is lower, and the cloud droplet effective diameter (cloud ED) is larger. The total N_a of marine type aerosols is generally lower than that of continental type aerosols, but for aerosols with particle diameters greater than 1 μm , the marine type aerosols are higher. The study shows a strong negative N_a -cloud ED relationship for marine type aerosols, but no obvious N_a -cloud ED relationship for continental type aerosols. The number of cloud condensation nuclei (CCN) is higher under high- N_a conditions; the ratio of CCN to N_a reveals that the activation efficiency of marine type aerosols is higher than that of continental type aerosols. There is no obvious difference in activation efficiency between day and night.