Aircraft observation is the most important way to directly obtain the cloud microphysical characteristics. However, due to limited conditions (instruments and funds), there are relatively few aircraft observation data on cloud microphysical characteristics. The aircraft observations of cloud microphysical characteristics in China are mostly concentrated in the Beijing-Tianjin-Hebei region, and related research on southern China is still very rare. Guangxi, as a typical province in southern China, has significant differences in climate characteristics and source emissions from the central and eastern of China. Therefore, the observation of cloud microphysical characteristics in Guangxi is of great significance for a comprehensive understanding of aerosol-cloud interactions in the East Asia. This study gives the data of 9 cloud-crossing aircraft observations, which can provide valuable data support for our in-depth understanding of aerosol-cloud interactions. More importantly, this paper gives the vertical distribution and interaction relationship of aerosols and clouds at different times of the day. Although there is a lack of aircraft observation data at nighttime, the vertical distribution of aerosols and clouds changes little at nighttime due to relatively stable atmospheric conditions, that is, the planetary boundary layer is relatively stable at nighttime and its impact is relatively small. The diurnal variations of the vertical distribution of aerosols and clouds, especially the discussion on the impact of diurnal variations in the planetary boundary layer on their vertical distribution and interaction, are the highlights of this paper. Additionally, this paper discussed the differences in the impact of aerosols from different sources on cloud microphysical properties. They demonstrated that this region's correlation between aerosols and clouds conforms to the Twomey effect. The ultimate goal is to provide observational constraints for the simulation of aerosol radiative forcing in global climate models. Therefore, I recommend that the article should be published after revision.

Thank you for your decision and constructive comments on our manuscript. We have carefully considered the suggestion and tried our best to improve and make changes to the manuscript.

The blue part has been revised according to your comments. The line numbers are in the revised manuscript; the changes are identified in red. Revision notes, point-to-point, are given as follows:

1. There are some formatting errors in the manuscript that need to be carefully revised, such as the lack of space in line 19 and the lack of superscript in line 145. I will not list them one by one, and the author needs to carefully check and revise the entire manuscript.

Response: Thank you for your comment. We have carefully reviewed and corrected the manuscript's formatting errors.

2. abstract, line 37-38, the specific response characteristics of the Twomey effect of aerosol-cloud should be discussed in detail. On the contrary, the observation overview of line 16-21 needs to be simplified and a brief description is sufficient. The direct verification of the Twomey effect through aircraft observation is a very important observational fact and needs to be described in detail.

Response: Thank you for your comment. We have revised the content of the abstract. Based on aircraft observations, we simplified the observation overview and added a description of the specific response characteristics of the Twomey effect of aerosol-cloud. Below is the modified abstract.

Aerosols and clouds play essential roles in the global climate system, and aerosol-cloud interactions significantly impact the earth-atmosphere system's radiation balance, water cycle, and energy cycle. To understand the effect of aerosols on the vertical distribution of stratocumulus microphysical quantities in southwest China, we analyzed data from nine aircraft observations over Guangxi from October 10 to November 3, 2020. This analysis focused on the temporal variation characteristics and formation mechanisms of stratocumulus microphysical profiles, considering the influence of aerosol number concentration on the source of air mass and individual cases. Aerosol number concentration (Na) and cloud droplet concentration (Nc) decreased gradually with the altitude increase below 1500 m and did not change with the height between 1500 m and 3300 m. The temperature inversion layer at the top of the planetary boundary layer (PBL) hindered the increase in the cloud droplet particle size. The lower layer of the stratocumulus cloud in Guangxi mainly contained small-sized cloud droplets (effective diameter of cloud droplet, E_d < 15 μm), and the middle and upper layer cloud droplet was large particle-size cloud droplet (E_d > 20 μm). The vertical distribution of cloud microphysical quantity had apparent temporal variation. When aerosols in PBL were transported to the upper air (14:00 to 20:00), Nc in the lower layer decreased, and the small particle-size cloud droplets (E_d < 20 μm) in the middle layer and upper layer increased. Aerosols from the free atmosphere were transported into PBL (10:00 to 13:00), providing an abundance of cloud condensation nuclei, which increased the number of small particle-size cloud droplets in the lower layer of the cloud (near the top of PBL). The characteristics of cloud microphysical quantity were also affected by the source of air mass and the height of PBL. Na and Nc were high under the influence of land air mass or aerosols within PBL, and the cloud droplet number concentration spectrum was unimodal. Na and Nc were low under the influence of marine air mass or above the boundary layer, and the cloud droplet number concentration spectrum was bimodal. The relationship between stratocumulus and aerosol in this region is consistent with the Twomey effect. E_d and Na remain negatively correlated in different liquid water content ranges, and FIE (the aerosol first indirect effect) ranged from -0.07 to -0.58.

3. Line 113-116 does not need to be divided into a separate paragraph and can be directly merged with the previous paragraph.

Response: Thank you for your comment. We have merged the content with the previous paragraph to ensure the coherence and flow of the manuscript.

4. 2.1. Aircraft data and reanalyze data. In this section the aircraft data and the reanalysis data are best presented separately.

Response: Thank you for your comment. We have adjusted the order of the introductions for the aircraft observation data and the reanalysis data. Section 2.1 now covers the introduction and processing methods of the aircraft data, while Section 2.2 introduces the reanalysis data. This ensures that readers can more clearly understand the various data sources.

5. line 164. Need to give a reason why Zn is defined?

Response: Thank you for your comment. We have incorporated Zn's necessary information and references in lines 164-167 to address these omissions.

Define the relative heights of the cloud as Zn:

$$Zn = \frac{Z - Z_{base}}{Z_{top} - Z_{base}}$$

In the formula, Z_{base} is the height of the cloud base, and Z_{top} is the height of the cloud top. The cloud heights have been normalized by setting the cloud base as 0 and the cloud top as 1.

6. 3.2 Diurnal variation of the vertical distribution of cloud microphysical quantities. This section is the research highlight of this paper, but the title does not highlight of the research. I recommended to highlight the impact of planetary boundary layer evolution in the title and analysis content. Since this manuscript lacks nighttime observation data, it cannot be strictly called diurnal variation. I recommended that the authors weaken the description of diurnal variation.

Response: Thank you for your comment. We acknowledge that the lack of nighttime observations limits our ability to capture regional diurnal variations in stratocumulus clouds adequately. Our study is based on observations made by nine aircraft during the day, when planetary boundary layer height changes significantly and the vertical transport activity of aerosols is intense, leading to a more pronounced and rapid impact on clouds. We recognize that including nighttime data would provide a more complete picture of these clouds. We have ensured that this limitation is clearly stated in the manuscript and emphasized the impact of planetary boundary layer evolution on cloud microphysical properties. The manuscript's expression "diurnal variation" has been changed to "temporal variation."

7. 3.3 Influence of aerosols on microphysical quantities of stratified clouds. The title of this section directly points to the impact of the Twomey effect.

Response: Thank you for your comment. We have changed the title of Section 3.3 to "Verification of the Twomey Effect" to ensure that it intuitively reflects the content of this section.