

## Response to reviewer#2

Thank you for your careful works and valuable comments. The comments and suggestions are very useful for our manuscript. We have carefully studied these comments and suggestions and made some changes in our manuscript.

### Comment 1)

In line 87, the photons should pass through a collimating lens, a narrow band optical filter and a converging lens, before being focused onto PMT.

#### Response:

Thank you for your comment. In response to feedback, we have revised the description of the optical path. Specifically, the order of components in the sentence has been corrected to: "The photons then pass through a collimating lens, a narrow band optical filter, and a converging lens before being focused onto the active area of a photomultiplier tube (PMT)." on page 4, line 87 of the manuscript.

### Comment 2)

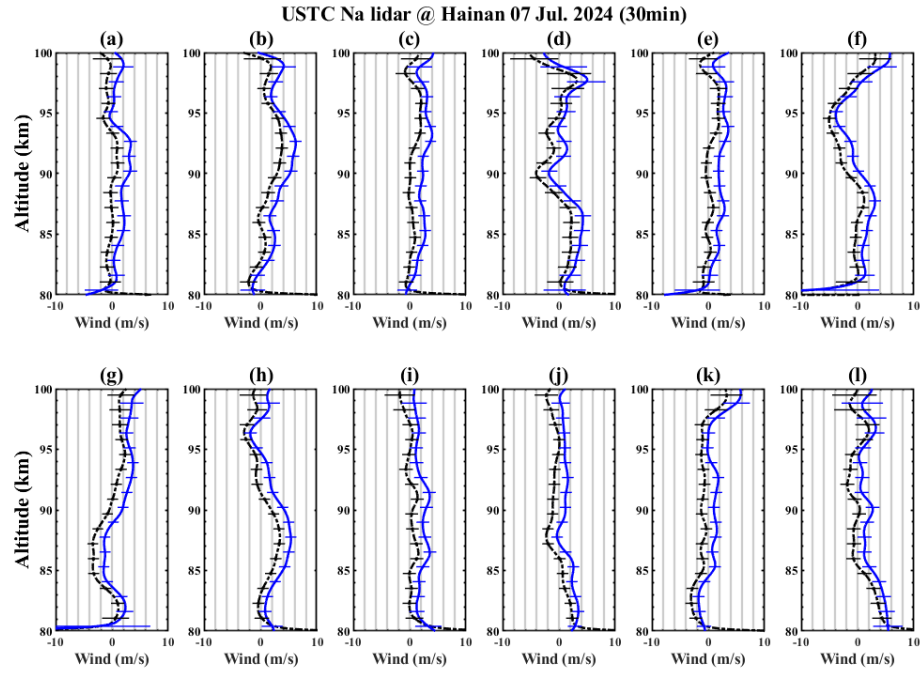
An improvement of the lidar shown in the manuscript is the frequency offset monitor unit. Was the measured frequency offset corrected in the lidar measurements shown in the Figure 6?

#### Response:

Thank you for your suggestion. Figure 6 displays the uncorrected vertical wind observations: the nightly average (solid line) and 30-minute profiles (dashed lines). The systematic offset in the average, as explained in Section 2.3, is attributed to the characterized laser frequency offset. Therefore, the corrected wind field, which essentially removes this known offset, is not separately plotted.

A comparison in Fig. 1 reveals consistent trends between the nightly-mean-subtracted vertical wind (black dashed line) and the frequency-offset-corrected wind (blue solid line), with the latter resolving finer atmospheric structures. This agreement supports the efficacy of the frequency monitoring module in correcting systematic instrumental

biases.



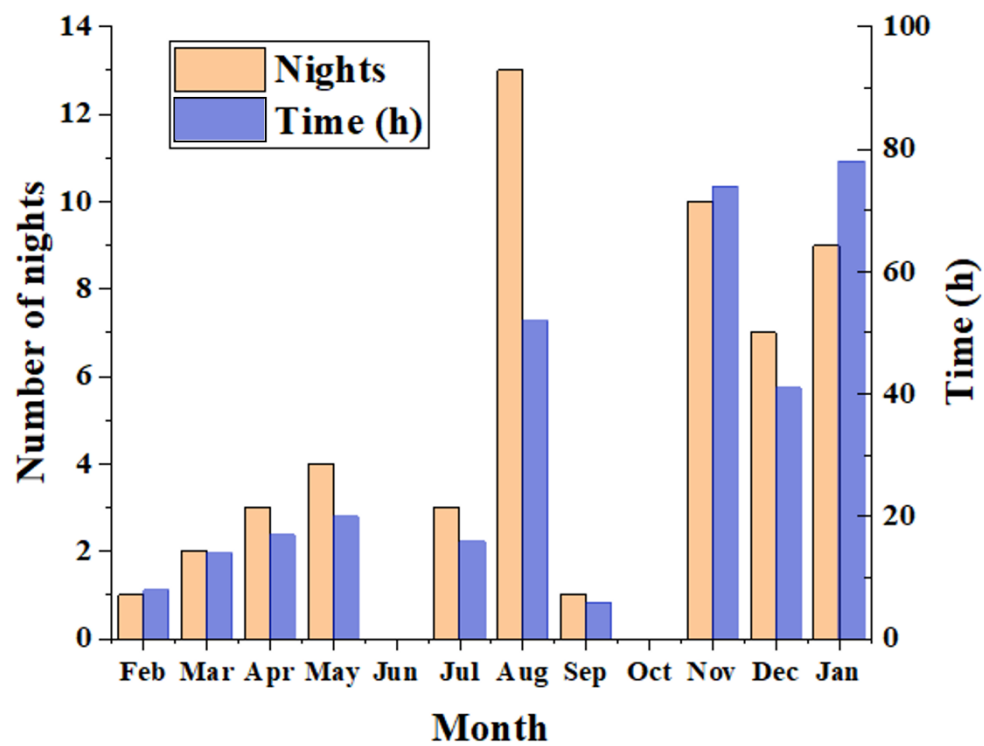
**Figure 1.** Sodium layer vertical wind (black dashed line) and the vertical wind after correcting frequency offset (blue solid line) at 30 minutes on 7 July 2024. Error bars are shown as thin lines.

### Comment 3)

In the Figure8, the histogram color of the measurement hours is different from the color in the legend.

### Response:

Thank you for pointing this out. When adjusting the color scheme of the figures to avoid red–green combinations, we inadvertently neglected to update the corresponding colors in the legends. This inconsistency has now been rectified, as illustrated in Fig. 2, and the same revision will be incorporated into the revised manuscript accordingly.



**Figure 2.** Histogram of number of nights and hours with valid data observed by the USTC sodium lidar at Hainan.