Reply on RC2

Dear Reviewer,
We are grateful for your careful reading of our manuscript and for the insightful comments and suggestions you provided. Your feedback has been extremely helpful in revising and refining the paper. We have taken all of your remarks into account and made corresponding changes in the revised version of the manuscript.

We respond to each of your comments in detail below.

Major Comments

1. **Remark:** The regression in Fig. 12h looks totally unconvincing, even though an equation is provided (equation 22). In fact, all equations in the text and in figures should be provided with both the value for Pearson's r and P. Note calculation of the P value takes into account the number of values used. Hence, a reasonable value for r (e.g. >0.5) is not necessarily associated with a relationship that can be distinguished from regressing random numbers (which can be inferred if e.g. P < 0.05).

   Answer: We agreed with the comment of the first reviewer, who noted that "the absolute values of the longwave fluxes are poorly constrained and that attention should be focused on the differences between the two local observing sites, indicating the impact of the fog layer." Therefore, Figure 12, which originally presented the longwave radiation for fog events, has been revised to show the differences between the two sites instead. For this updated version of the plot, the Pearson correlation coefficient is 0.83, and the corresponding p-value is 1.8×e-10. These values indicate a strong and statistically significant correlation.

2. **Remark:** Fog phases v fog stages: Line 191 refers to 'fog phases', but Lines 334 onwards describe 'fog stages'. Choose the terminology 'phase' or 'stage' and use this throughout.

   Answer: We have chosen the fog stages version, and it was consistently changed throughout the whole article.

3. **Remark:** Normally, visibility measured at 2 m above the ground is used to define the onset of fog, with fog defined as visibility <1 km. The authors subdivided fog events into phases/stages (Line 191), but they don't seem to have used their own visibility measurements. How do the fog development phases relate to visibility at 2 m (which would have been measured at the time of balloon launch by the TFMini instrument whenever the OPC-N3 was used – according to lines 181 and 184). I suggest a figure is added to the Appendices showing 2 m visibility data for the three fog events in relation to the fog stages - or add the visibility observations to Figure 5.

   Answer: The TFMini sensor was installed to assess its potential usefulness for visibility estimation. This sensor is typically employed in mechanical systems for distance measurement. Deriving visibility information from this device requires further investigation, and at present, we do not plan to publish results, as its calibration for this purpose is challenging. Moreover, on the observation site, there was no dedicated instrument for direct visibility measurement. The division into fog stages was done based on the amount of LWP (exceeding or not exceeding 15gm^(-2)).

A panel showing visibility has been added to Figure 5. The visibility estimate was derived using data from the ShadowGraph instrument. Specifically, the retrieved r_eff and LWC values were used to calculate visibility according to the Koschmieder formula.

4. **Remark:** The summaries of fog development for each night of observations (in Sections 4.2.2, 4.2.3 and 4.2.4) are very difficult to follow using the profiles shown in Figures 7, 8 and 9. This is because in the figures the same colour is used for every profile of the same variable. Different variables are shown with different colours. Instead it will be far easier for the readers to follow the written summaries of fog development if, for every variable there is a set colour for each stage of fog development (e.g. red for development, grey for mature, blue for disappearing).

   Answer: The colors in the Figures 7,8,9 has been changed. Each panel has the same colors palette, corresponding to different stages of fog evolution pink corresponds to the formation stage, blue to the mature stage, and yellow ochre to the dissipation stage.

5. **Remark:** Lines 566-567 'At the bottom of the fog, the smallest droplets evaporate.' What is the evidence for this? Evaporation of small droplets is feasible after sunrise from the top of fog layers, but not from the bottom. Instead, Weedon et al. (2024, QJRMS, https://doi.org/10.1002/qj.4702) argued that the inception of radiation fog is determined by the creation of suspended droplets, that is faster than their removal by occult deposition (direct deposition onto vegetation). Couldn't the small droplets at the bottom of the fog be removed progressively by occult deposition rather than evaporation?

   Answer: We acknowledge the reviewer's comment and appreciate the reference to Weedon et al. (2024), which provides valuable insights into the formation and evolution of radiation fog. In our observations, however, the situation appears somewhat different. As shown in the droplet spectra (Fig. A6) for the dissipation phase, droplets are present above 30 m, while no droplets are observed below this height. This phase occurred after sunrise, when solar radiation begins to supply energy to the surface, thereby inhibiting further droplet formation.

   While it is well established that in optically thick fog, droplet evaporation typically initiates from the top, our observations primarily concern optically thin fog layers. In such cases, solar radiation can more effectively reach the surface and lead to warming from below. We propose that, in these conditions, droplet evaporation may indeed occur at the base of the fog. Therefore, we suggest that in our observed case, evaporation near the fog base, rather than occult deposition, may explain the absence of small droplets at lower levels.

Figure Comments

We appreciate the reviewer's suggestions. The recommended changes to the figures have been made accordingly.

Minor Comments

We sincerely appreciate the reviewer's attention to detail. The minor comments have been addressed as recommended, and we are thankful for the valuable corrections that improved the grammar and overall language quality of the manuscript.

Apart from the changes made in response to the comments from Referee 1 and Referee 2, we have also improved the preprocessing of the radiometer data. Specifically, short spikes in the signal—likely caused by transient obstructions such as birds—were removed using a filtering algorithm. Furthermore, the radiometric signal was smoothed using a 10-minute running mean.
It is also possible that water condensation occurred on the lower longwave (LW) radiometer during foggy conditions. We suspect such an event happened between 05:40 and 06:22 UTC on 11 September, during the dissipation of the fog. As a result, the corresponding flight conducted during this time has been excluded from the radiative closure analysis to ensure data quality.