Reply to community comment

Thank you for your constructive comments, which are very helpful to improve the paper and clarify our points. Our point-by-point reply follows with the original comments quoted in `Courier` font.

1. `If the authors explain the behavior of predicted radiative cooling shown on their Fig. 9. In particular, why is it so small after the initial surge?`

Following the fog formation, a substantial increase in the fog-top entrainment weakens the liquid water gradient at the fog top, subsequently diminishing the radiative cooling (Fig. S1). Figure S2 depicts the lagged correlations between the entrainment at the fog top and the LWC within the fog layer and at the fog top. The correlations peak with a lag of 5 and 10 hours for the layer-averaged and fog-top LWC, respectively. This indicates that it takes several hours for the entrainment to weaken the radiative cooling Another reason is the rapid growth of the fog layer depth during the initial phase(Fig. S3). We added the related descriptions (lines 389-395).

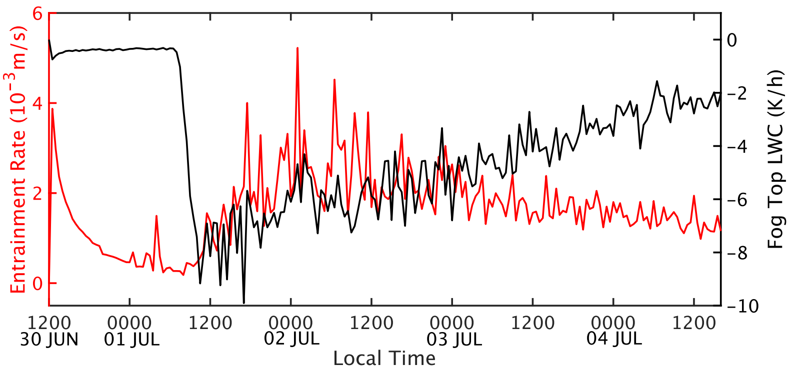

FIG. S1 Time series of entrainment rate (red line) and LWC rate at fog top (black line) for the constant solar radiation simulation. The fog top is defined as the height where the maximum LWC rate occurs.

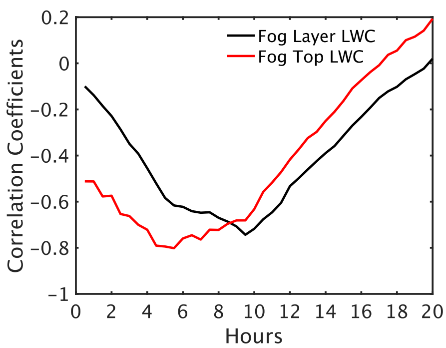

FIG. S2 Lagged correlation coefficients of the fog-top entrainment with LWC for integral boundary layer (black line) and at fog top (red line). The fog top is defined as the height where the maximum LWC rate occurs.

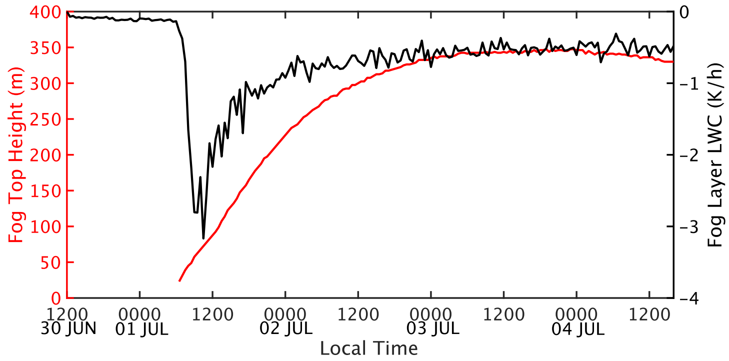

FIG. S3 Time series of LWC for the integral fog layer (black line in K h^{-1}) and fog top height (red line in m) for the constant solar radiation simulation.

2. Also, this ir cooling amount is substantially less than in stratocumulus under clear sky conditions, assuming that this cooling acts similarly for advection fog and for stratocumulus (e.g., see Gerber et al.: 14th AMS Conf. on Atm. Radiation, 7-11 July, 2014, Boston, MA., paper 9.3.).

Current Fig. 10 shows the heat budget for the fog layer, which differs from the heat budget profiles in previous studies (Curry and Herman 1985; Fu and Liou 1992; Gerber et al. 2014). We also examined the time-series maximum in LWC profiles (Fig. S4), which fluctuates around 8 K h^{-1} after fog formation and then steadily decreases. The fog-top LWC is somewhat less than the counterpart for typical stratocumulus clouds (Gerber et al. 2014). This may be attributed to the difference in free atmospheric humidity between fog and stratocumulus scenes. In the case of stratocumulus clouds, the corresponding descending motion results in drier air compared to the free atmosphere above fog. We added the related descriptions (lines 395-401).

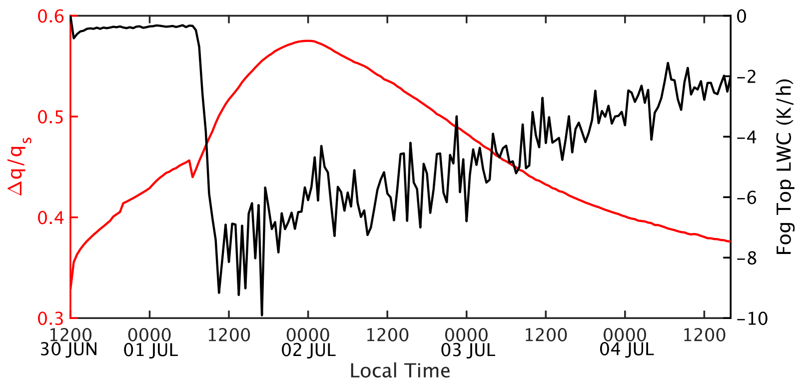

FIG. S4 Time series of humidity stratification (red line) and LWC rate at fog top (black line) for the constant solar radiation simulation. The humidity stratification is the differences in averaged specific humidity between boundary layer and 1–2 km that is normalized by the surface saturation specific humidity. The fog top is defined as the height where the maximum LWC rate occurs.

3. Further, can you comment on the grid spacing used in your model if it is sufficient to deal with the details of the usually very

narrow fog-top interface that may need sub-grid parameterization.

We increased the vertical resolution to 1 m below 50 m and 5 m above 50 m. The simulation produces smoother variation in fog top height and stronger liquid water content at the fog top compared with the original simulation. The dissipation time of sea fog is delayed by 12 hours. However, the main conclusions remain unchanged. We substituted the analyses and results in this paper with simulations at a higher vertical resolution (lines 148-150, Figs. 6-14).