Replies to the Editor and reviewers are in blue. Reviewers' comments are in black.

The authors would like to thank the reviewers for their helpful and interesting comments on the manuscript. Hereafter we answer all the comments. Our responses to the reviewers' comments appear in blue. Please also note that we have mitigated our discussion on non-local effects for fog development. Also we have added more information on the cause of formation of radiation fog at elevated level and a new paragraph in section 4 on the need to improve our knowledge on the fog life cycle along the vertical.
Modifications in the main text appear in red.

REVIEWER 1 :

Authors state in the updated manuscript that "The site is installed in a semi-urban area with mixed land-cover including forest, lake, meadows and shrubs next to a built-up area. It is located on a plateau elevated 60 m higher than the surroundings." and in the reply for the Reviews "Moreover it seems to us that very stable fog without turbulence does not exist." Does this actually mean that because of the local topography, you cannot observe the development of radiation fogs from the first steps at SIRTA station, as fog is first formed in the surroundings, and it is already developed when the top reaches the plateau 60m higher than surrounding? This naturally depends on the size of plateau and wind speed/direction, but could certainly explain the lack of stable fogs. Because of this addition, I feel a more detailed information is needed connecting plateau size, wind speed and turbulent intensity affecting the droplet activation if such is not presented in earlier studies related to SIRTA observations.

Radiation fog events initially formed at the surface are observed at SIRTA (Stolaki et al., 2015 ; Mazoyer et al., 2017). As already mentioned in section 3.3 of the present paper, this characteristic represents 12% of the radiation fog events sampled during the field campaign. The other 88% were initially formed at elevated level (~150 meter above ground level), and reached the ground in a very short time (<30 minutes). Mazoyer et al. (2017) demonstrated that it is a consequence of the tree drag effect (and not local topography) when the wind meets this obstacle and the deposition effect, which reduces the formation of droplets near the surface. The differences in terms of meteorological and microphysical properties of two contrasted radiation fog events formed at the surface (F32) and in altitude (F9) are presented in detail in sections 3.3, 3.4 and 3.5.

We agree with the reviewer that further study should investigate deeply the relation between droplet activation, droplets evolution and turbulent intensity. Turbulence in radiation fog is mainly driven by fog-top cooling and by vertical wind shear (e.g. Figure 2 of Yang et al., 2020 for instance). This means that vertical wind and turbulent motion profiles are needed to investigate the origin of turbulence in fog and its impact on fog evolution. However, the experimental set up of the ParisFog field campaigns do not allow us to investigate these processes.

Following the the reviewer's comments, we have added :

- more information in section 3.3 on the cause of formation of radiation fog at elevated level : « Mazoyer et al. (2017) demonstrated that it is a consequence of the tree drag effect (and not local topography) when the wind meets this obstacle and the deposition effect, which reduces the formation of droplets near the surface. »

- a new paragraph in section 4 on the need to improve our knowledge on the fog life cycle along the vertical : « The study presented in this paper focused on the fog life cycle based on ground-based observations. Bergot et al. (2015) and Mazoyer et al. (2017) showed that surface heterogeneities can induce significant variabilities in the vertical distribution of the fog layer. Waersted et al. (2017) observed using remote sensing instruments a critical role of vertical structures in the fog layer in controlling fog top radiative cooling. Recent studies have underlined the necessity to add a detailed representation of activation processes along the vertical (Egli et al., 2015; Stolaki et al., 2015, Mazoyer 2016). Further field investigations of the vertical distribution of fog meteorological and microphysical properties are required to provide insight on the microphysical processes driving fog variability and the relationship between turbulence,radiation, droplets activation and droplets evolution in order to improve the representation of processes parameterization of fog events by NWP models.

REVIEWER 2 :

I am still not entirely convinced that the arguments relating to advection are valid. For example, the authors appear to be claiming that radiation fogs do not advect but this is not the case! On balance however I think there is enough useful material (microphysics observations) to merit publication.

We agree with the reviewer that radiation fogs can be advected. However, as stated by Ducongé et al, 2020, local processes are balanced by non-local processes. In some configurations local effects are more important than non-local ones and a good understanding of microphysics becomes a requirement.

As our text was not clear, sentences in the discussion session had been modified to :
To limit the impact of non-local effects, only radiative and stratus lowering fog have been selected in our analysis.
Also sentence have been added in a new paragraph in section 4:
Further field investigations of the vertical distribution of fog meteorological and microphysical properties are required to provide insight on the microphysical processes driving fog variability and the relationship between turbulence,radiation, droplets activation and droplets evolution in order to improve the representation of processes parameterization of fog events by NWP models.
And in the Fog type and classification session to:
To minimize the impact of non-local effects (Ducongé et al, 2020), only radiative and stratus lowering fog have been selected.

References

Ducongé, L., Lac, C., Vié, B., Bergot, T., & Price, J. D. (2020). Fog in heterogeneous environments: the relative importance of local and non‐local processes on radiative‐advective fog formation. Quarterly Journal of the Royal Meteorological Society, 146(731), 2522-2546.

Mazoyer, M., Lac, C., Thouron, O., Bergot, T., Masson, V., & Musson-Genon, L. (2017). Large eddy simulation of radiation fog: impact of dynamics on the fog life cycle. Atmospheric Chemistry and Physics, 17(21), 13017-13035.

Mazoyer, M., Burnet, F., Denjean, C., Roberts, G. C., Haeffelin, M., Dupont, J.-C., and Elias, T.: Experimental study of the aerosol impact on fog microphysics, Atmospheric Chemistry and Physics, 19, 4323–4344, doi:10.5194/acp-19-4323-2019.

Yang, Y., & Gao, S. (2020). The impact of turbulent diffusion driven by fog‐top cooling on sea fog development. Journal of Geophysical Research: Atmospheres, 125(4), e2019JD031562.