

Interactive comment on “Large-eddy simulation of radiation fog: Part 1: Impact of dynamics on microphysics” by Marie Mazoyer et al.

Anonymous Referee #2

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Review of “Large-eddy simulation of radiation fog: Part 1: Impact of dynamics on microphysics” by By Mazoyer, Lac, Thouron, Bergot, Masson & Musson-Genon Submitted to Atmospheric Chemistry & Physics Manuscript: acp-2016-900

Recommendation: Major revisions required.

Overview: This manuscript presents an original and thorough examination of a fog event at a site with varying land use (grass and trees). The authors have used LES simulations to assess the impact of a line of trees on the formation and lifecycle of the fog. A variety of different simulations were used to determine which processes were having the largest effects on the fog, and this has resulted in improved understanding of this scenario, as well as some recommendations for improvements in further fog simulations.

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The presentation of the manuscript could be significantly improved by being proofread by a fluent or native English speaker. There are many spelling and grammatical errors in the manuscript, as well as a considerable number of instances of awkward phrasing. The formatting of the manuscript is also inconsistent. These problems make the manuscript very hard work to read, and obscures the nuance and scientific value of the authors work, which is otherwise good.

Scientific comments:

1. P3, line 33: What sort of profiler are you using?
2. P4, line 17: How do you differentiate between radiation fog forming under very low (150m) cloud, and cloud lowering to the surface? You describe this event as follows: “the cloud base height progressively subsided during about 30 min, until it reached the ground”. This sounds indistinguishable from stratus fog.
3. P4, lines 24 & 25: It is not clear to which TKE measurement you are referring here. The increase in TKE at 10 m occurs ~30 minutes before the increase at 30 m, not simultaneously. After this increase there is still quite a lot of variability in the TKE, so I would not describe it as constant.
4. P5, lines 1 & 2: There is a ~30 minute difference in timing between the increase in LWC and Nc.
5. P9, line 13: More detail about the temperature convergence is required – i.e. the temperatures measured at different heights converge.
6. P9, line 14: If only RH is being considered, it is not accurate to say that fog formed at 0230, only that saturation was reached. You need to refer to e.g. a visibility measurement.
7. P9, line 22: This increase in TKE occurs > 30 minutes before the TKE increase in the observations.

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8. P10, line 25: Please define the difference between sedimentation and deposition.
 9. P11, line 9 and onwards: You keep switching between LWC and ρ_{eff} throughout the manuscript. It would be better to consistently use one or the other.
 10. There are a few statements throughout the manuscript which are accompanied by “not shown”. Is there a particular reason why they are mentioned, but not included in plots?
 11. P15, line 6: What do you mean by the “production” of N_c ?
 12. P16, line 5: In the context of fog microphysics, 3m is not especially “near surface”.
- Technical comments:
1. Section 2.3.1: Not all terms of the equations presented in this section are defined in the text.
 2. Section 2.2.3: The figure numbers in this section do not correspond to any of the figure captions.
 3. P9, lines 17-19: It is difficult to see the negative temperature gradients in Fig. 2, due to the number of lines.
 4. P9, lines 20 & 22: Please refer to Fig. 3a & 3b, instead of just Fig. 3.
 5. P11, lines 15-17: It would be helpful to the reader if the different phases of the fog lifecycle were marked on any plots showing a time series of data.
 6. P11, line 30: “when the fog reached approximately 80 m”. Is this the depth of the fog, the height of the fog top, or the location of the cloud/fog base?
 7. P11, line 33: Fig. 7d shows updraft velocity, not cooling.
 8. Section 3.3: Marking the location of the trees on plots of spatially varying data would make the figures easier to interpret.

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9. Please put the figures in the order in which they are first referred to in the text.
10. There are numerous occasions where the figures are incorrectly referenced in the text. Please correct this.
11. When plotting a time series from the LES, please state where in the domain the data was from.
12. P18, line 12: Are you referring here to the surface, or 3m?
13. References: The capitalisation of journal titles and place names in the reference list is inconsistent, there are also some references missing page numbers.

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