

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

Anonymous Referee #3

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This paper presents large eddy simulations of a radiation fog event for which extensive research quality observations were available. The main focus of the paper is to uncover how different aspects of the model dynamics affect the fog evolution, and sensitivity to the surface treatment, initial conditions and model dynamical formulation are investigated. Whilst the work is interesting, and ultimately worthy of publication, I feel extensive modifications to the manuscript are required before it is suitable for publication.

Firstly, the manuscript is very difficult to read, due to numerous spelling and grammatical mistakes. A revised version would benefit from extensive proof-reading and typographical editing, possibly with the help of a native English speaker. I have provided suggestions for the abstract below, to give the authors an idea on the level of modification required:

C1

L2 - should say "...during the ParisFog..."

L4 - should say "...of a tree barrier..."

L7 - should say "...as in the observations, and..."

L10 - should say "...meaning that grid convergence..."

L12 - should say "...and had a similar effect to removing the tree barrier."

L13 - should say "...allows us to..."

L13 - should say "...necessary to correctly simulate the fog life cycle at high resolution."

Secondly, the manuscript lacks structure and coherence. It currently just presents a long list of things you have done, with no real theme linking everything together or justifying the various experiments. The introduction should focus on the specific problem you are trying to address - how dynamics affects the evolution of fog, what specific questions are you trying to answer? This should then provide justification for the sensitivity experiments you conduct - how do they help you answer the questions? The conclusions should then tie all this together and answer those questions. It is possible that in doing this, you may be able to shorten the text (which is currently quite long) and number of figures, to only focus on what is really relevant.

I only have two specific scientific comments:

Sect 2.3.2 - why do you choose an empirical diagnosis of visibility based on the cloud water content and drop number, rather than calculating the visibility accurately from Eqn. 7? With the complicated microphysics scheme you have available, you should be able to calculate the extinction coefficient directly, e.g. as done by Clark et al. (2008).

P9, L32 - do you have observations of the surface or soil temperatures which you could compare to the model here to explain the difference in upwelling LW radiation?

Reference:

C2

Clark, P. A., Harcourt, S. A., Macpherson, B., Mathison, C. T., Cusack, S. and Naylor, M. (2008), Prediction of visibility and aerosol within the operational Met Office Unified Model. I: Model formulation and variational assimilation. *Q.J.R. Meteorol. Soc.*, 134: 1801–1816. doi:10.1002/qj.318

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