

Interactive comment on “Hectometric scale simulations of a Mediterranean heavy precipitation event during HyMeX SOP1” by Olivier Nuissier et al.

Anonymous Referee #2

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General comments

This manuscript presents a 150 m horizontal grid spacing 12h LES simulation over a relatively large area on the Mediterranean basin of a deep moist convection real case (HyMeX SOP1 IOP16a) (offshore MCS moving towards SE France). It is a valuable contribution to the field because it describes, as stated by the authors, the first LES of a heavy rainfall event over the Mediterranean area, with the added value of selecting an event with a complete observational data set collected during the HyMeX SOP1 field campaign to verify the simulation. The structure of the manuscript is adequate and the text is generally clear despite in some parts some minor corrections are necessary -

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see specific details below. I also think that the discussion of the results would benefit from considering the following two aspects.

Firstly, authors could compare in more detail the simulations with available observations (for example weather radar or satellite data): some parts of the text seem more focused on comparing the 150 m simulation with the 450 m simulation than with the observations available, probably authors performed this analysis but it could be better reflected in the text and in figures (for example figures 5, 6 and 7 would largely benefit from showing also observations as it is done in figure 4).

Secondly, authors provide a good comparison of their results with previous simulations of the same case study, which is very interesting, but they could also, at least briefly, compare their results with other similar previous studies (either ideal or real cases) using LES - I include a few in the references but others could be considered. For example Heath et al also compare 150 m with 450 m LES of a deep convection case and find that higher resolutions worsen results because entrainment is more important and apparently moisture updrafts are too diluted.

For all the above I believe this manuscript must be considered for publication but cannot be accepted in its current form. I encourage authors to consider these general and also specific comments below for preparing and submitting an improved version of this very interesting paper.

Specific comments

1. Page 2, line 14. Suggest: the deep convection -> deep convection
2. Page 3, line 6 (and elsewhere). You write "500m" here without a blank space between the number and the units but elsewhere you leave a blank space (i.e. page 1, line 5) - please be consistent.
3. Page 3, line 19. Please add the year of the second reference cited in this line.
4. Page 3, line 20. Do you mean "the authors's" (plural) or really a specific author

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(singular)?

5. Page 3, line 21. Please check "has already been performed"-> "has been performed yet"
6. Page 4, figure caption 1. Please specify which infrared channel was used.
7. Page 6, line 5. typo: last word should be 'conditionally'
8. Page 6, line 10 (and elsewhere). Typo: mentionned -> mentioned
9. Page 7, line 5. Please check sentence (2 items): 1st item) stretched -> stretched? and 2nd item) "with a spacing not varying continuously with altitude" do you mean that or simply "with a irregular spacing"? Please clarify and check meaning.
10. Page 7, line 30. was retained -> were used? Please check meaning.
11. Page 7, line 30 (and elsewhere): an other -> another
12. Page 8, line 1 (and elsewhere): untill -> until
13. Page 8, line 15. Please check meaning: fairly simulate -> simulate fairly well
14. Page 9, figure 5b. I find a bit misleading the y-axis title, and also the fact that it is not the same as that used in the figure caption; I suggest using "Surface precipitation coverage" or simply "Precipitation coverage" instead. Moreover, as mentioned earlier I recommend to add, to both panels, the corresponding observed magnitude derived from weather radar observations.
15. Page 9, line 14. suggest: an area -> the area; and also exceeding -> exceeded
16. Page 10, figure 6. Please add here another column with the observed radar reflectivities (blank spacing between the 3 columns may be removed to allow larger panels)
17. Page 11, line 8. et -> and

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18. Page 11, line 10. Typo: whith -> with
19. Page 12, figure 7. Please add another column with the corresponding satellite observations.
20. Page 12, line 3 (and elsewhere). suggest larger -> greater
21. Page 12, line 9. Typo: updraught -> updraughts
22. Page 13, line 10. Suggest: 50% more the values for LR150 -> 50% the LR150 values
23. Page 15, figure 10. The comparison of the four panels is difficult without a common geographical grid or a length scale: in panel a) the grid is missing, in panels b) and c) there is one grid despite it is not the same, and in panel d) it is not obvious which part should be compared. Please add either a grid (preferably) or a length scale to each panel.
24. Page 17, figure 11 caption first line. Check: crossection -> cross section
25. Page 18, figure 12. Is precipitation also shown in the figure panels? If so please indicate it on the figure caption.
26. Page 20, line 18. fairly -> fairly well?
27. Page 20, line 30. be is -> be
28. Page 20, line 32. "combining and mixing"? I do not understand what authors mean by 'mixing' here, please clarify.
29. Page 24, please check and correct reference Martinet et al: author names duplicated and title missing.

References

Heath, N. K., Fuelberg, H. E., Tanelli, S., Turk, F. J., Lawson, R. P., Woods, S., & Freeman, S. (2017). WRF nested large-scale simulations of deep convection during

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SEAC4RS. *Journal of Geophysical Research: Atmospheres*, 122(7), 3953-3974.

Khairoutdinov, M. F., Krueger, S. K., Moeng, C. H., Bogenschutz, P. A., & Randall, D. A. (2009). Large- ϵ eddy simulation of maritime deep tropical convection. *Journal of Advances in Modeling Earth Systems*, 1(4).

Talbot, C., Bou-Zeid, E., & Smith, J. (2012). Nested mesoscale large-eddy simulations with WRF: performance in real test cases. *Journal of Hydrometeorology*, 13(5), 1421-1441.

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