

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

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General comments:

We fully agree with this general remark. In this present study, we recognize that we are not showing any sensitivity experiments to assess the precise role played by the lateral boundary conditions and we also recognize that the conclusion presented here is too affirmative. The predictability of this heavy precipitation event, associated with offshore deep convection over the sea, is relatively low compared with more classical events anchored over the mountain range foothills. The direct orographic forcing appears less crucial while the convective systems were moving over the sea, but the neighbour-

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ing mountains are able to deflect the environmental mesoscale flow. We agree that the model physics could also have a strong impact on the simulation. As a matter of fact, Martinet et al. (2017) showed for this case study that the formulation of the mixing length impacts the simulated surface precipitation through, in some cases, greater low levels moisture advection and hydrometeor contents within the convective system. Moreover, Thévenot et al. (2016) and Rainaud et al. (2017) even showed that taking into account the wave effect or sea surface conditions in different parameterizations of the sea state are able to modify locally the spatial distribution of the precipitation, although the overall rainfall pattern is globally well reproduced.

We agree that all these aspects are important but it must be emphasized that, during IOP16a case, the location and the evolution of deep convection over the sea (in particular the split into two distinct systems CS1 and CS2) are closely controlled by the upstream conditions (i.e. low levels moisture convergence generated by a surface low pressure located between Spain and Balearic Islands) and how they propagate inside of our LES domains. This split of deep convection over the sea is a real challenge for this case study. Another numerical experiment could consider a larger LES domain encompassing these upstream conditions. Although this LES over a very large domain would suffer from expansive computing time, it would be able to address whether a higher resolution simulation of these features is crucial. All these aspects have been included and discussed in the revised version of the paper.

Specific comments:

- 1) Page 2, line 22: The sentence has been rewritten.
- 2) Page 2, line 27: The text has been corrected.
- 3) Page 2, line 28: The text has been corrected.
- 4) Page 2, line 34: The text has been corrected.
- 5) Page 3, line 1: The text has been corrected.

- 6) Page 3, line 7: The text has been corrected.
- 7) Page 3, line 14: The text has been corrected.
- 8) Page 3, line 21: The text has been changed.
- 9) Page 3, line 23: The text has been changed.
- 10) Page 4, line 15: The text has been changed.
- 11) Page 6, line 3: The text has been changed.
- 12) Page 6, line 10: The word has been corrected here and throughout the text.
- 13) Page 7, line 4: The sentence has been rewritten accordingly.
- 14) Page 7, line 13: The text has been changed.
- 15) Page 7. Additional parametrization schemes have been added in the model description accordingly.
- 16) Page 7, line 30: The word has been corrected here and throughout the text.
- 17) Page 8, line 8: The word has been corrected here and throughout the text.
- 18) Page 8, line 9: The sentence has been rewritten.
- 19) Page 8, line 15: The text has been corrected.
- 20) Page 8, line 4: The text has been changed.
- 21) Page 9, line 12: The sentence has been rewritten.
- 22) Page 9, line 14: The text has been corrected.
- 23) Page 10, line 2: The text has been corrected.
- 24) Page 10, line 11: The text has been corrected.
- 25) Page 10, line 11: We agree with this remark. We cannot state “essentially due to

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the lateral boundary conditions...”. The sentence has been rewritten (see also response to general remark).

26) Page 11, line 1: The sentence has been rewritten.

27) Page 11, line 11: The text has been corrected.

28) Page 11, line 13: The text has been corrected.

29) Page 11, line 23: The text has been corrected.

30) Page 11, line 29: The text has been corrected.

31) Page 11, line 31: The text has been corrected.

32) Page 11, line 32: The text has been corrected.

33) Page 12; line 3: The text has been corrected.

34) Page 12, line 9: The text has been corrected.

35) Page 13, line 1: The sentence has been rewritten.

36) Page 13, line 2: The text has been corrected.

37) Page 16, line 1: The text has been corrected.

38) Page 16, line 2: The text has been corrected.

39) Page 16, line 4: The sentence has been rewritten.

40) Page 16, line 5: The text has been corrected.

41) Page 16, line 11: The text has been corrected.

42) Figure 10: We agree with this remark. It is not obvious to compare all simulations against observations as the simulation domains are different initially. However former Figure 10 has been redrawn zooming over the region of interest on the observations and including a grid on each panel.

- 43) Page 16, line 26: The text has been corrected.
- 44) Page 16, line 33: The sentence has been rewritten.
- 45) Page 17, line 3: The sentence has been rewritten.
- 46) Figure 12: In the revised version former Figure 12 has been improved adding the horizontal and vertical scale.
- 47) Page 8, line 1: The text has been corrected.
- 48) Page 20, line 18: The text has been corrected.
- 49) Page 20, line 18: The text has been corrected.
- 50) Page 20, line 29: The text has been corrected.

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