

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

Anonymous Referee #1

Received and published: 6 December 2019

General comments

This paper compares simulations of an offshore Mediterranean mesoscale convective system having different resolutions and analyses the triggering and organizing factors. It was found that increasing the horizontal resolution did not significantly reduce the deficiencies found in the coarser grid simulation. The reason is stated to be due primarily to issues with initial and lateral boundary conditions. It was noted that more realistic fine scale features were obtained with the higher resolution simulation. Overall this is a well organized paper with one of the main goals being to determine if a significantly higher resolution improves the models agreement with observations. It achieves that

C1

goal even though the result is that very little improvement is gained for this particular case. Additionally a conceptual model is presented of the main physical processes taking place as the system evolves. My main concern is that it is stated that initial and lateral boundary conditions are the culprit, without any evidence provided that this is indeed the problem. It would help if the problems that are thought to exist with the initial and lateral boundary conditions and how they might be detrimentally affecting the simulation were discussed more thoroughly. Moreover, it seems likely that deficiencies with the model physics could negatively impact the simulation, and this should also be discussed. Is it possible that topography in this region, which is typically not handled very well by models if it is steep, is degrading the simulation? Finally there are numerous grammatical errors and unusual phrasing throughout the text that need to be addressed, as well as some issues with the figures.

Specific comments

- 1) Page 2, line 22: This is a very awkward sentence. Maybe change to something like “While these previous studies have shown that a horizontal resolution of about one kilometer is able to simulate many of the observed features of Mediterranean HPEs, as well as their associated key physical mechanisms, they have difficulties representing the time at which convection is triggered and its organization.”
- 2) Page 2, line 27: “carried out numerical simulation of HPE case study”. Might sound better to say “carried out numerical modeling HPE case studies”.
- 3) Page 2, line 28: “similarly with”. Might sound better to say “similar to”.
- 4) Page 2, line 34: “kilometers” should be “meters”.
- 5) Page 3, line 1: “depending of” should be “depending on”.
- 6) Page 3, line 7: “with eddy-diffusivity” should be “with the eddy-diffusivity”.
- 7) Page 3, line 14: “calls to”. Unusual wording. Maybe say “motivates the adoption of a Large . . .”
- 8) Page 3, line 21: change “already” to “previously”.

C2

- 9) Page 3, line 23: maybe change “truthful” to “realistic”. Although your conclusion is that there may be issues with the initial and boundary conditions, so they are unlikely to be as realistic as they need to be.
- 10) Page 4, line 15: maybe change “to some” to “for”.
- 11) Page 6, line 3: change “an unique” to “a unique”.
- 12) Page 6, line 10: “mentionned”. Spelling is incorrect here and elsewhere.
- 13) Page 7, line 4: “The vertical grid is stretched with a spacing not varying continuously with altitude”. Stretched should be spelt stretched, and maybe change the sentence to “The vertical grid spacing is stretched with altitude”.
- 14) Page 7, line 13: Change “while other 20” to “while the other”.
- 15) Page 7. The model description should include mention of the radiation, surface flux, and topography schemes, even if it is just to say that they are the same as used in a previous study.
- 16) Page 7. Line 30: change “An other” to “Another” here and elsewhere in the text.
- 17) Page 8, line 8: “over sea” should be “over the sea”. And elsewhere.
- 18) Page 8 line 9: “It allows to better understand and model the triggering mechanisms within the convective systems.” Awkward wording.
- 19) Page 8, line 15: “fairly simulate”. Maybe “simulate fairly well”.
- 20) Page 8, line 4: “These large surface precipitation are induced by the convective systems CS1 and CS2 mentionned earlier”. Maybe change to “These regions of large precipitation are caused by ...”.
- 21) Page 9, line 12: “This domain enables to encompass the evolution of the convective system over sea, not considering here mainland precipitation.” Spelling mistake and awkward wording.

C3

- 22) Page 9, line 14: “exceeding” should be “exceeds”.
- 23) Page 10, line 2: “examinated” “examined”.
- 24) Page 10, line 11: “for a too long time” “for too long”.
- 25) Page 10, line 11: “essentially due to the lateral boundary conditions imposed by AROME-WMED analysis”. How do you know this?
- 26) Page 11, line 1: “just east tip of Spain”. Needs to be reworded.
- 27) Page 11, line 11: “upper level” “upper levels”.
- 28) Page 11, line 13, “organizing in” “organizing into”.
- 29) Page 11, line 23: “development evolution”. Choose one of these words.
- 30) Page 11, line 29: “of Balearic Islands” “of the”
- 31) Page 11, line 31: “already” maybe “previously” . 32) Page 11, line 32: “than those” “to those”.
- 33) Page 12, line 3: “updraught” “updraughts”.
- 34) Page 12, line 9: “updraught” “updraughts”.
- 35) Page 13, line 1: “favouring lifting more easily”. Awkward wording.
- 36) Page 13, line 2: “enhance” “enhances”.
- 37) Page 16, line 1: “resolution than” “resolution as”.
- 38) Page 16, line 2: “in depth” maybe “significantly”.
- 39) Page 16, line 4: “rainfall evaporation under the convective system” maybe change to something like “rainfall evaporation at low-levels in the convective system”, since the rain is part of the convective system and not under it.
- 40) Page 16, line 5: “more precisely dynamics” “the dynamics more precisely”.

C4

- 41) Page 16, line 11 "thanks to" "by".
- 42) Figure 10: It is hard to make out how the radar relates to the model results. It looks like they have different scales.
- 43) Page 16, line 26: "abutting"?
- 44) Page 16, line 33: "in a too abruptly manner". Need to reword.
- 45) Page 17, line 3. "enables to emphasize"> Need to reword.
- 46) Figure 12. Is there any way this can be improved. What is the horizontal and vertical scale?
- 47) Page 16, line 2: "just front of very". Need to reword.
- 48) Page 20, line 18: "over Mediterranean" "over the".
- 49) Page 20, line 18: "captured fairly" "captured fairly well".
- 50) Page 20, line 29: "could be is". Need to reword.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-937>, 2019.