

## ***Interactive comment on “Breeze effects at a large artificial lake: summer case study” by Maksim Iakunin et al.***

### **Anonymous Referee #1**

Received and published: 21 May 2018

#### General comments:

This paper studies the lake breeze effects caused by the Alqueva reservoir (Portugal), which is the largest artificial lake in Western Europe. The paper concentrates to a 3 days long modeling case study done with the Meso-NH model. Simulations are done with and without the reservoir and different kind of measurements are used to evaluate the skill of the model. The results show the existence of a lake breeze and how it influences the local areas. The paper links nicely to previous studies and support their analysis of the breeze effects.

I think the paper fits in the scope of HESS and should be published after some modifications. There are some specific areas that need more analysis and modifications. The language of the manuscript should be improved as there are too many sections

when the text is rather difficult to follow. I have marked some points to the “Technical corrections” section, but the list is not comprehensive. I suggest that the authors get editing help from someone with full professional proficiency in English.

Specific comments:

P1, line 11: Does “It” at the end of the sentence link to the lake breeze or to the Atlantic breeze system? This part is unclear without reading the text.

Figure 1: The text in the a) part is too small. Please consider saying grid boxes instead of pixels. Also, would be more informative if the pictures would actually show the grid boxes, i.e. the resolution would be more visible. The underlying map could be surface orography, like in Figure 9.

The units used in this manuscript seem to have slightly different font than the main text. Is there a reason for this?

P4, lines 14-15: You discuss here about the dataset (the main dataset for this work). It would be clearer to talk about “the measurement data”. The modeling data is also a dataset.

P6, lines 15-16: This small chapter could merged with the first chapter of section 4.1. Also, you mention that ECMWF data is used at the lateral boundaries with an update frequency of 6 hours and in chapter 4.1 that the model is capable of doing multi-scale grid nesting techniques. It would be nice to know more how the simulations were really done. I would assume that ECMWF data was used only for the 4-km resolution (even then 6-hourly boundary forcing seems to be a bit coarse) and the higher resolution used some kind of nesting to this (e.g. 1-km was nested to 4-km and 250-m was nested to 1-km). If this is the case, what was the later boundary update frequency of the nests? Overall, more details about the modeling structure are needed.

P7, line 14: Do you have a citation for value used for attenuation coefficient?

P9, lines 5-6: Did you try to include the radiosonde accuracy limits in Figure 4? This

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could improve the plots.

P9: You mention the supplementary material, but not the numbers of the figures you are referring to. Please add these to the text.

P10, lines 10-11 and P12, lines 10-11: The comparison of wind speed is interesting in Fig. 4, but what information does it bring to compare the 10-meter wind speed from the model against the measured 2-m wind speed (Figures 5 and 6)? Did you try to convert the 2-m wind speed to 10 m height (or vice versa)? You mention this possibility, but why was it not done? Comparing the same variable on different heights requires more explanation in the text.

P11, Fig. 5. The text font is quite small. Please increase it.

P12, lines 14-15: Are the simulated results more smooth due to difference in plotting frequency (modeled output 1-hourly, what about the measurements? I could not find the information from page 5 for latent and sensible heat fluxes; I assume it is the same as for the variables listed in P5L1). Are the model outputs accumulated over the output frequency? What about measurements? The peak difference seems to be quite large, especially on July 22nd and there should be more discussion about this.

P12, line 14: What are you trying to say with “Dynamic”?

P16, lines 1-9 and Figure 10: Please change the colorbar scale as currently it is too coarse. Perhaps you could try using the limits -5 to 5 degrees with 0.25 degree

P16, line 32: You can use the word “lake” instead of “mass body”

P17, line 34 – P18, line 2 and Fig 12: Like with Fig 10, I think you are using too coarse colorbar in your plots (-10 to 10 % difference are not shown) to see the effect of transport (and night-time differences). Please try to improve the figure in this respect and update the text accordingly.

P17, Fig 12: Could you please name the cross-sections (e.g. I and II) and inform about

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this in the caption. Also, please refer to this naming in the text when discussing about the cross-section results.

P18, Figure 11: Could you add to the plot the BL height as seen by the model? Please also increase the font size.

P18, line 9: The water vapor mixing ratio indeed has a minimum around 14:00-15:00 o'clock, but the values are higher than 7-8 g/km on July 23rd and 24th (8-9 g/kg). So the minimum values are not between 7-8 g/kg every day.

P20, line 2: Where is the dam exactly? Please mark it to the maps.

P20, Fig 13: Please increase the font size.

Could you have done any lake water temperature (surface) comparison between the measurements and the model? Although the simulation period is short, the comparison would give some information how good your initial conditions were and how well you model the lake dynamics and the atmosphere-lake interactions.

Conclusions: You list the main results of your work (basically the lake breeze effects), but I would like to see a bit more discussion about their implications.

Technical corrections:

P1, line 1: "could" to "can"

P1, lines 1-2: rewrite the end of the sentence starting from "but usually"

P1, line 2: "lakes" to "lake"

P1, line 5: comma after "reservoir"

P1, line 6: here FLake scheme is used, later FLake model (e.g. P2, lines 26-27). Please be consistent with the description (model is widely used)

P1, line 7: "this" to "these"

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P1, line 8: the reservoir

P1, line 18: “0.35 %” to “0.35%”

P1, line 26: “the warm summer period” to “warm summer periods”

P1, line 26: “, forcing” to “leading to”

P2, lines 3-4: Consider changing to “These regional lake effects have been seen in previous studies”

P2, lines 10-11: remove “, and others” and use “and” before “terrain types...”

P2, line 12: “In this work,”

P2, line 14: “A first report” to “The first report”

P2, line 15: “as part of” to “as a part of”

P2, lines 16-19: The sentence starting “They concluded, “ is very hard to follow. Please rewrite and make it clearer.

P2, line 20: “were done” to “was done”

P2, lines 22-24: Sentence starting “Later,” should be improved

P2, lines 25-28: this chapter needs to be rewritten

P2, lines 29-33: This chapter needs also to be improved. Especially the first sentence and the end of the chapter requires some attention.

P2, line 34: Is “the object of current study” really needed?

P3, line 1: move “used in this work” after “numerical models”

P3, line 7: “if” to “of”

P4, line 5: Consider starting a new sentence with “An average annual...”

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P4, line 8: remove “inside it”

P4, line 16: “has last” to “lasted”

P4, line 16: remove “included” and replace it with something like “was to utilize”

P4, line 27: Add comma after “also”

P4, lines 30-31: Consider changing the end to “while the floating platform Montante situated in the middle”

P5, line 9: “has last” to “lasted”

P5, line 10: “have been” to “were”

P5, line 13: consider writing “because the atmosphere was mostly stable and anticyclonic conditions were present”

P5, lines 20-21: Add the first sentence to the first chapter, i.e. remove the gap (line break).

P5, line 22: please add “, and” after “precipitation”

P5, line 24: “platforms” to “platform”

P6, Table 1: “Deep convction” to “Deep convection”

P6, lines 4-6: The sentence starting with “Mixed microphysical...” should be rewritten. A suggestion: “A mixed-phase microphysical scheme...”, leave out “and explicit precipitation” and add to the end “was used”. The next sentence could start with “The model solves longwave and...”

P6, line 8: “exchange is controlled”?

P6, lines 11-14: The end of the chapter should be improved. For example, for the 1-km and 250m domains it is better to say something like “the resolution is high enough for the deep/shallow convection to be solved explicitly” Also, the reference to Table 1 is

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missing the number and the brackets are left open. The list is missing “and” from the end.

P6, lines 15-16: remove “files” and ending should be improved (e.g. “for lateral boundary forcing with an update frequency of 6-hours”)

P6, line 17: “the one” to “one”

P6, line 19: remove “-”

P6, line 20: “have covered” to “covered”

P7, line 5: “the freshwater lake...”

P7, line 6: “were” to “was”

P7, line 15: A new chapter starts so better to say “The initial parameters used in FLake are”

P7, line 29: rewrite, a suggestion “the depth of the artificial lakes varies spatially, because”

P8, lines 8: “to compare” to “analyzed”

P8, line 10: “of” to “took place between” (and remove second “took place”)

P8, line 13: merge this chapter with the first one in section 5.1

P8, line 14: comma after “point”

P8, line 17: rewrite the end of the sentence, e.g. “22 km height; thus, to build a corresponding profile, three...”

P9, line 6: “95.5 %” to “95.5%”

P9, line 17: “11.26 %” to “11.26%”

P9, line 14: “magnitude are” to “magnitude is”

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P9, lines 11 and 15: “supplementary” to “supplementary”

P9, lines 15 onwards: make a real list of the statistical values (“following: temperature average bias. . ., humidity average. . ., and for the wind speeds...”)

P10, line 1: “accordance” to “accord”

P10, line 6: “are” is missing. Also, you could add “It should be mentioned that not all...”

P10, line 8: “visible in” should be change to e.g. “which can be seen from”

P10, lines 10-11: this small chapter can be merged with the previous one

P10, line 10: “100 %” to “100%”

P12, line 1: This seems to be a new chapter and yet you refer to “these stations”, please correct.

P12, lines 23-24: Please rephrase this sentence (starting “Measurements”).

P15, line 1: Rephrase, e.g. “To study. . . affects the surrounding area, the following. . . were analyzed in this work:”

P15, lines 2-5: Is the sentence starting with “Overall, simulation result...” necessary?

P15, line 6: A comma after “During daytime” and add “the” before water temperature and air temperature.

P16, line 1: A new chapter and you refer with “its” to? Lake breeze should be mentioned here.

P16, lines 12-15: Please rephrase the sentence starting with “Maximum of the temperature” It is too long and complicated.

P16, line 22: “nighttime” to “night-time” and you could move the part in brackets to be before the comma.

P16, line 31: A new chapter starts, where does “this” refer to?

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P18, line 3: use “the cross-sections”

P18, line 9 and Fig. 14: “g/Kg” to “g/kg”

P19, line 3: “increase” to “increases”

P20, line 1: “this zones” to “These zones”

P20, line 5: “proeminent” to “prominent”

P20, Figure 13: “KG/KG” to “kg/kg”

P21, line 5: “figure out” to “resolve”

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-201>, 2018.

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