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Ocean Science
Discussions

Interactive comment on "Modelling deep-water formation in the North-West Mediterranean Sea with a new air-sea coupled model: sensitivity to turbulent flux parameterizations" *by* Léo Seyfried et al.

Anonymous Referee #2

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This paper presents a new modelling system consisting in a coupled ocean-atmosphere model and show some results regarding deep-water formation events in the North Western Mediterranean. Additionally the authors run some sensitivity experiments to show the impact of the choice of flux bulk formulas. I think the paper addresses an interesting topic, is well written and the results are interesting. Therefore I recommend it for publication after some issues are addressed. I have recommended a major review because there are many small issues to address, even if none of them are critical.

In general I think that some more details should be provided in what regards the modelling system description and the different bulk formula that are used in the paper, as these are key aspects to understand the results. Another issue is that I think the results are not discussed in depth. For instance, an important question that is now present in the modelling community is what is the role of high resolution on the modelling of these type of processes. In this sense, it is not clear to me what part of the improvement brought in this modelling system is due to the high resolution and which part due to the air-sea coupling. Some discussion on this aspect would be appreciated.

Also,the atmospheric domain looks relatively small so I wonder if the good results of the atmospheric parameters aren't induced by the lateral boundary conditions. Again, what is the role of the coupling in the good quality of the results? Could one obtain similar quality using uncoupled models? Finally, you have shown that the choice of bulk formula have small impacts on the evolution of each parameter but a huge impact on the dense water volume formed (for instance). In your opinion, what should be done to improve the parameterizations? What kind of observations would help to improve them?.

Detailed comments Page3 L4-7. As the paper has an important technical component it would be good to provide more details on the platform.

P3 L7-9. Please, provide more details on what are the conclusions of those studies. Why the air-sea coupling is benefitial? What is it providing?

Introduction. I think that the interest of using a coupled system to analyse DWF should be better presented.

P3 L30. How many levels are close to the surface?.

P3 L32. The modelling of convection is of paramount importance in this paper. Thus, more details on how this is parameterized should be included.

Section 2.1. Please, give more details about SURFEX. For non-expert readers its role

in the modelling system is confusing.

P4 L5. A "3" is missed in OASIS-MCT

Section 2.2. P4. L23. The different parameterizations used are for Cd, Ch and Ce? Please, be more clear in the description of the paremeterizations and include more details. This is also a very relevant part of the paper and the reader needs to know what are the differences between the different options.

P5 L8 "They also allow the impact of the sea spray in ANDREAS to be distinguished". I don't understand this sentence. Could you please clarify the text here?

P7.L6. Please, summarize the conclusions of Estournel et al. (2016a).

P7.L28-32. I think this paragraph is too pesimistic. The agreement between different time series is very high and differences are not so large .

P8 L1-2. Conversely I think that the extremely high correlations in the SST are overoptimistic and due to the seasonal cycle.

P8.L5-L7. Can you do a rough estimate of what is the relative importance of each mechanism (local process vs advection) ?

P8.L9-10. I think ANDREAS shows at least comparable skills with respect to MOON.

P8. L23-25. I don't understand this. It looks from the figures that differences that differences between simulations are larger during the peaks. How can you deduce that the feedback mechanism is playing a significant role?

P9. L5. I agree MOON provides the best agreement, but it is just slightly better. Considering the simulation period is relatively small I think you should moderate that statement.

P13. L13. ".. demonstrates that XXX are strongly ..." . XXX - Something is missed.

Conclusions. I don't see that MOON is really outperforming the other parameteriza-

tions. For instance, for the SI on Leg-2 COADS seems to produce better results.

Figure 1. Define in the caption what is DWF and NBF.

Figure 2 . What is each subplot? What is the x-axis?

Figure 3. What are the colours in (e) ? Isn't it redundant to use them in a time-depth plot?

Figure 4. What are the grey bars in the plots?

Table 1 "sigMa"

Table 3. Include the averaged SI index obtained from observations, so the biases can be better interpreted.

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