

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-239

Anonymous Referee #2

Referee comment on "Towards kilometer-scale ocean–atmosphere–wave coupled forecast: a case study on a Mediterranean heavy precipitation event" by César Sauvage et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-239-RC2>, 2021

This study assesses the impact of the coupling between ocean and atmosphere, atmosphere and waves, and the tri-coupling atmosphere-ocean-wave (without taking into account the impact of waves on ocean characteristics) on a heavy Precipitation event which occurred over France and Mediterranean Sea using the forecast system developed at Météo-France. It consists of the AROME model for atmosphere, Nemo for ocean and Wave-watchIII for waves. The paper is well organised and shows in a convincing way that the coupling between atmosphere and ocean affects the heat and moisture supply to the atmosphere and hence the accumulated precipitation in the convective system, while the coupling between atmosphere and waves modifies the wind stress and wind speed, impacting the location of the system in the forecast. A discussion on the numerical impact of each coupling is added at the end of the manuscript helping the reader to have an idea of the benefit/loss of each coupling. I think this work is a very nice contribution to the scientific community in its effort to improve the forecast of High impact Weather event, and thus deserves to be published after minor modifications needed to clarify some results.

Main comments:

- the WASP parametrization is described in details in the document and the equations reveal the strong dependence of several terms to the wind at the first level of the atmospheric model: in this forecast system, the lower level is at about 5m. Would it be possible to have more details on the vertical distribution of wind in the model, and a better assessment of the sensitivity of the results to the height of the first model level?

- following the same idea of better assessing the sensitivity of the results to the choice of the model configuration: how much the frequency of coupling can affect the results?

- isn't it a problem in the interpretation of the results the fact that the initial state of SST is different when the atmosphere is coupled to the ocean or not?

Minor comments:

- section 4.1: why is the reduction of latent and sensible heat fluxes stronger in AOW compared to AO than between AW and AY?

- section 4.1, l320: the authors say that this reduction is mainly due to the slow down of the wind but did they check the others parameters?

- section 4.2: if more moisture is extracted from the ocean to the atmospheric low level in AOW than in AW as said on l.360, why don't we observe a modification of RH2m (l.373)?

- Fig.10: light blue lines for reflectivity are very difficult to see.