

Interactive comment on “A zooplankton diel vertical migration parameterization for coastal marine ecosystem modeling” by Ariadna Celina Nocera et al.

Anonymous Referee #3

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General Comments

This study uses a 1-D NPZD model with a theoretical parameterization of the zooplankton diel vertical migration (DVM) to infer its impact on coastal ecosystem and carbon export. Simulations cover a wide range of parameters to analyse the sensitivity of the DVM and its impacts to model parameters (e.g. grazing rate, optimal irradiance) and boundary conditions (e.g. winds conditions). The authors conclusion stress the importance of the grazing rate and the swimming speed to accurately represent the carbon export in coastal shallow marine ecosystems

I found the objective of this study difficult to identify. What is the overall goal of the study

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? While the experimental set up seems sound, results from previous model studies including a DVM parameterization are not discussed, which makes its impossible to identify new scientific inputs from the present study. Only one is really cited (the 1D model of Bianchi et al. 2013) and not thoroughly discussed. As an example, in the latter study, the optimal irradiance (I_c) chosen was $1 \cdot 10^{-3} \text{ W} \cdot \text{m}^{-2}$, an I_c that is not even in the range of the tested parameters while the authors acknowledge its utmost importance in "accurately" reproducing DVM. What would be the added value to 3-D biogeochemical models (e.g. see Bianchi et al, 2013b; Aumont et al. 2018) ? Moreover, the choice of a coastal set up with shallow waters but with only surface turbulence considered would have required some justification, particularly if one of the main message of the study is referring to "benthic zooplankton". Coastal region where there is no tides or internal waves that will generate turbulence/mixing above the seafloor are so common ? What is the rationale to justify the relationship between phytoplankton availability and DVM ? Finally, the authors claim that "the zooplankton grazing rate and swimming speed parameters are particularly important for an accurate representation of the carbon export in coastal shallow marine ecosystems", but no observations whatsoever is given to backup this assertion. As a conclusion, "as is", this study is not put in the context of either modeling studies or observational studies. The parameterization chosen and the experimental set up is not really discussed either.

Few specific comments : p3 line 27: irradiance p8 line 9: Why restrict the analysis over a zooplankton biomass threshold ? p9 line 18: On fig 4d the isolume is quite shallow (because of high phytoplankton concentration, I guess) therefore there is no need for zooplankton to go deep, isn't it ? Is this what you meant by this sentence : "The grazing rate is not sufficiently large to deplete phytoplankton, which remains abundant enough to provide zooplankton for a reason (with respect to the parameterization) to remain at this depth." ?