

Ocean Sci. Discuss., author comment AC1  
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## Reply on CC1

Georgy I. Shapiro et al.

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Author comment on "High-resolution stochastic downscaling method for ocean forecasting models and its application to the Red Sea dynamics" by Georgy I. Shapiro et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2020-119-AC1>, 2021

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**Comment.** The mentioned "double penalty" effect should be expected in downscaling due to the fact that the coarse model has first of all a coarse bathymetry compared to the higher bathymetry of the downscaled model. Therefore, the spatial displacement of hydrodynamical features should be expected especially in areas with not smooth bathymetry.

**Response.** It is an interesting thought. We have found that more detailed bathymetry and the coastline result mainly in the differences in the area integrated vorticity. Clarification is given in lines 420-423 of the revised MS.

In our calculations the double penalty was more of traditional nature as explained in Crocker et al. 2020: 'If the location of a feature in the model is incorrect, then two penalties will be accrued: one for not forecasting the feature where it should have been and one for forecasting the same feature where it did not occur (the double-penalty effect, e.g. Rossa et al., 2008). This effect is more prevalent in higher-resolution models due to their ability to, at least, partially resolve smaller-scale features of interest.' Clarification is added in lines 322-342 of the revised MS.

**Comment.** I propose to the authors to look the recent Red Sea paper here below and add the relevant citation: Hoteit, I., Abualnaja, Y., Afzal, S., Ait-El-Fquih, B., Akylas, T., Antony, C., Dawson, C., et al. (2020). Towards an End-to-End Analysis and Prediction System for Weather, Climate, and Marine Applications in the Red Sea. Bulletin of the American Meteorological Society, 1-61. <https://doi.org/10.1175/bams-d-19-0005>.

**Response.** We are thankful for bringing our attention to the paper by Hoteit et al (2020). It is an interesting and comprehensive paper. It covers a wide range of topics many of which are outside the scope of our manuscript. We plan to work on some of the issues covered in this paper and add relevant discussions and citations in our future publications.