

## ***Interactive comment on “A Model of Black Sea Circulation with Strait Exchange (2008–2018)” by Murat Gunduz et al.***

**Murat Gunduz et al.**

[murat.gunduz@deu.edu.tr](mailto:murat.gunduz@deu.edu.tr)

Received and published: 22 November 2019

Interactive comments ( >> *italic black*) by Anonymous **Referee # 2** (RC2).

*Authors' responses are given in blue print in each section*

>> The manuscript reports development of a high resolution Black Sea circulation model, with additional coupling the basin hydrodynamics with exchange flows at Bosphorus Strait by including an artificial box on the Marmara side. It is a big effort such high resolution model to run with complicated time dependent boundary conditions that could be the case, different than actual conditions. According to the authors, the objective is to achieve coupling with Bosphorus Strait, extending the domain to include a portion of the Marmara Sea and also the Azov Sea.

C1

*We thank Referee #2 for a brief description of the paper.*

>> In my opinion, this main objective of this paper is rather well met. The abstract is compact containing the purpose of the study and the most important results. The scientific approach and applied methods are valid. The manuscript is well organized and accomplished by briefly reviewing some of the relevant literature and explaining how the current study is related to them beginning from earlier studies up to recent researches skipping unnecessary details. On the other hand, I am not sure that this model enables to capture the trend of rapid climatic change observed in the Black Sea. Although satisfactory results, the model with current configuration is far from producing results comparable with real observations. Discrepancies can be through the time dependent boundary conditions, i.e. imposing climatological river discharges rather than actual, inaccuracies in precipitation and evaporation estimates, as well as model approximations of the free surface. All these factors could have contributed to the difference in model and observed values. While this paper entitled "A Model of Black Sea Circulation with Strait Exchange (2008-2018)" is a model development paper, could be published in the journal after technical corrections.

*We thank Referee #2 for an encouraging review, based on a positive reading of the manuscript. We are aware of the problems that are mentioned in the review and intend to continue our efforts to improve the model results in the present paper as well as in future work that is already planned: To name a few, we have already constructed monthly river fluxes of main rivers, and intend to introduce corrections to shortwave radiation penetration component, based on climatological chlorophyll-a obtained from satellites. The model results have been rigorously compared with the available ARGO floats (thousands of profiles), and to the authors' knowledge, there has not been any similar effort in the Black Sea model literature, even though the ARGO observations are free for public use. We believe that this is a rather important step for the Black Sea model community.*

>> Here is the list of suggested some corrections and changes:

C2

- Page 8, by the caption of Figure 4, "Marmara box shown in the 1" can be replaced by "Marmara box shown in the Figure 1"

*It is done.*

>> - Page 10, Line 15, please change "Table 1" with "Table 2".

*It is done.*

>> - Page 14, Line 10, the word "on" is written with double "o".

*It is done.*

>> - Page 16, Line 11, "May 2012" is wrongly written.

*It is corrected.*

>> -Figure 7 and Figure 14 are of poor quality. The plots color scale and contour level could be changed appropriately to demonstrate the thermohaline structure of the sub-regions and stations better.

*It is improved.*

>> - Table 2 and Figure 6, no unit information of fluxes in the caption and in the label of y-axis

*It is corrected.*

>> - No units were written on the figures and also in the captions starting from Figure 8 to Figure 10.

*It is corrected.*

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-163>, 2019.