Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2018-7-RC2, 2018

Ocean Science
Discussions
Open Access
EGU

Interactive comment on "Circulation of the Turkish Straits System between 2008–2013 under complete atmospheric forcings" *by* Ali Aydoğdu et al.

Anonymous Referee #2

Received and published: 11 March 2018

Authors use one model with a very good record (FESOM) and apply it to a unique ocean region, the Marmara Sea. I find the dynamics of Marmara Sea a novel topic. It is oceanographically interesting because circulation in the Marmara Sea is strongly dependent on the exchange with the neighboring basins, the Black Sea and the Mediterranean. However, I find some fundamental problems with this manuscript exactly in this part and do not recommend publishing it. With the following comments, I want to elucidate the basic problems, and help authors sharpen their paper if they want to submit a new manuscript. 1. What is strongly needed is that authors a) Demonstrate the power of using an unstructured-grid model compared to structured grid models when addressing the dynamics as dependent on the transport in the Straits of Bosporus and

Printer-friendly version

Discussion paper

Marmara. There are some references to earlier works, but there is not a critical comparison with structured grid models. Is the skill of unstructured-grid model and the proposed setup better in comparison to what is known from earlier works on the Marmara Sea modelling? b) Clearly demonstrate the superiority of FESOM compared to other unstructured grid models in the present study. Critical statements in the introduction about possible problems in other unstructured grid models need to be supported by a deeper analysis of results and inter-comparisons. Advantages or drawbacks of explicit and implicit models have to be made clear, in particular the representation of dominant processes in the studied area by different approaches. This would increase the credibility of present results; otherwise criticism would not be justified. c) Analyze, in a quantitative way, processes in the straits and the skill of model to replicate the basic physics. There your model is superior in comparison with the structured grid ones and you need to demonstrate this.

2. One sea forced by two straits presents a very interesting system to explore salt and mass balances and the role of straits for the water mass formation, in particular. This issue is only marginally addressed. Analysis is not very symmetric; more attention has been given to the Bosporus. One would like to see a figure similar to Fig. 12 for the Dardanelles. This is very important because the latter provides the source of deep water masses (see Fig. 6b; why is this figure cut at 100m?). The analysis of Fig 6 and associated processes needs to be extended down to the depth of the maximum reach of Aegean Sea water. It could be that the trend in Fig. 7 reflects a trend in the deep waters (or a problem with initialization). These comments lead me to the conclusion that authors have to deepen the physical interpretation of their results.

3. Some of the presented results could reveal that the mass and salt balance in the model is not correctly represented. This is a fundamental issue, which could convey very negative miss-interpretation of FESOM skills. Net water transport in Bosporus, as seen in Tabl. 4, is $\sim$150kmˆ3/yr; in the Dardanelles it is $\sim$100kmˆ3/yr. This is in contradiction with the net transport published earlier by one of the authors (Ozsoy and

Printer-friendly version

Discussion paper

Unluata, 1997, their Fig. 5) where it was shown that the water flux at the Marmara air-sea interface is minor in comparison to the straits transport. Results in Table 4 are also in contradiction with the statement “The resulting net water flux P - E varies between -4.7x10−8 and 2.5x10−8 m/s.” Taking the area of Marmara Sea ∼11.000 km^2 and looking in Fig. 3 where the mean water flux is ∼- 1x10−8 m/s yields also a negligible water flux at the Marmara Sea surface. Authors have to look closely how to explain the difference between ∼150kmˆ3/yr and ∼100kmˆ3/yr. They have to carefully check the conservation of mass and tracers and include this, if they submit a new manuscript. Unlike the models with large open boundaries, the Marmara Sea gives unique opportunities to address conservation properties and authors have to take advantage of it.

4. A further problem is identified in the comparison between Table 4 and Table 5 demonstrating that water flowing through the strait of Bosporus is two times less than what is reported in the literature (∼300 kmˆ3/yr). There are two problems here.

a) I wonder how with ∼two times smaller net transport authors simulate realistically the two layer transport and its impact on the Maramara Sea circulation. What about the deep layer transport in the Dardanelles? Isn’t there a trend in the system if you have unrealistic fluxes in the straits (see Fig. 7b)? b) Two times smaller net transport means that the fresh water balance in the Black sea is wrong. Led by these arguments, I again propose that authors present clearly the model forcing at all open boundaries, rivers and air-sea interface, as well as and the corresponding fresh water and salt balances for the Black Sea, Aegean Sea and Marmara Sea.

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2018-7, 2018.

Printer-friendly version

Discussion paper