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Interactive comment

Interactive comment on "The dynamics of İzmir Bay under the effects of wind and thermohaline forces" by Erdem Sayın and Canan Eronat

Anonymous Referee #2

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The manuscript "The dynamics of Izmir Bay under the effects of wind and thermohaline forces" studies the circulation of Izmir bay using a 3-D general circulation numerical model. A z-level free surface version of the Princeton model is used as the ocean model. The model is initialized using selected winter and summer hydrological cruise CTD data. The main aim of the paper is to study the effect of two forcing, i. e. wind and thermohaline, on the circulation of Izmir bay. Therefore, two sets of numerical experiments are carried out. In the first set of runs, the model is initialized using the CTD data and run without any other external forcing, including wind and heat fluxes. The second set of runs is similar to the first set, except that wind forcing is included. The wind forcing includes artificial constant wind from four main directions. The model is run until a steady current is achieved, i.e. when the kinetic energy level reaches a

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plateau. The circulation patterns are then studied under different forcing.

Considering the availability of long-term observational data in the Izmir bay and the scarcity of studies using numerical modeling for this region, this research has the potential to enhance the understanding of circulation of Izmir bay. However, I think that the paper needs major revisions as suggested:

1. In general some parts of the paper are difficult to follow and could be more coherent (e.g. the introduction). In my opinion, if some sentences (as suggested in the last section of this review) are rephrased, it be beneficial for a better understanding of the research. Considering that the previous papers by the same authors (e.g. Sayin 2003 & Sayin et al 2006) have a good structure and coherence, I think it is possible and worthwhile to revise this manuscript to have a more seamless structure.

2. Could you please present the reason for using an artificial wind forcing? Is it not possible to run the model with realistic data from synoptic stations or re-forecast atmospheric models? The application of using non-realistic forcing has a major drawback that the model cannot be validated against observational data. My understanding is that model validation is an important part of numerical modeling. Therefore, I would suggest that, if possible, the model be run with realistic forcing and after validation, be used for studies under different forcing such as artificial winds.

3. In my opinion, the result section can benefit from more explanation on the physical reason behind the occurrence of predicted patterns. The use of artificial wind in this research could be compensated by describing the physical reason behind the formation of different patterns. Although some explanation is given in this section, a more indepth study is constructive.

Regarding each section I have these suggestions:

Abstract:

A.1 I think it is beneficial to mention that artificial wind is used to force the model so

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that the reader does not expect a realistic model setup.

Introduction:

I.1. Although the introduction points out the importance of Izmir bay, in my opinion this section can benefit from a more coherent structure. Also, this section provides some extra information which I think is better to omit to increase focus on the main aim of the paper. For example, the reason for extra-shallow regions in the inner bay is not directly relevant to the study and I suggest removing these lines (28-32).

I.2. I would also suggest that more details on findings of previous research be given and the merit of the present research compared to previous studies be discussed. For example, in line 71 it is mentioned that Sayin (2003) has investigated the physical features based on modeling studies but no further explanation is given on the findings of his research. Similarly in line 66 the findings of Saner is not given.

1.3. In line 31 it is mentioned that elevation gradient maintained in the sea level affects the circulation. First, it is beneficial to include the source of this statement. Second, does this statement not contradict the statement given in lines 116-119?

Materials and methods: M.1. How are the vertical profiles of temperature and salinity in Izmir bay? Since a set of experiments focus on the effect of thermohaline forcing on the circulation, it would be helpful to add an explanation on how the profiles change in each season.

M.2. It is mentioned that at the open boundary observed temperature and salinity is applied. What is the frequency of these data? Are these data constant in time?

M.3. It is mentioned that the model is run until an equilibrium is reached. How long does it take for this steady current to occur? I think adding this explanation to the paper helps in understanding the nature of these forcing.

M.4. According to the supplementary explanations given as an answer to the first reviewer's comments, the wind is increased from 0 to 5 m/s in the experiments. Is that

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right? If so, in order to avoid confusion, I suggest to correct line 102 to include this explanation.

M.5. It is mentioned that the wind intensity is chosen to be 5 m/s but there is no reason as to why this speed is used. Is this speed chosen according to observed wind in Izmir bay? How does the wind change seasonally? This may be important in analyzing the effect of wind and stratification on the results. I think these questions can be answered by including the wind-rose in the paper and adding some explanation about the dominant wind and its intensity, if possible for summer and winter.

Results:

R1. As mentioned before, I think it is beneficial that a more in-depth explanation be given to why the described patterns occur rather than adhering to describing the patterns. For example in line 140, it is mentioned that the M pattern changes sign from winter to summer. Is it possible to give an explanation to why this happens?

R2. Are the current fields depicted in the figures depth-averaged fields? If so this should be indicated in the figures captions.

Conclusion:

C.1. Regarding the conclusion, I also have the opinion that this part is only a repetition of the results section.

Regarding the change in sentences I suggest to rephrase these lines:

Line 10: although I understand the meaning of this sentence by looking at the answer to the first reviewer comments, I think this sentence is still not clear for the reader and should be rephrased.

Line 14: The lasting strong wind from certain direction: be more specific, what is meant by certain directions.

Line 18: Outer and Inner Bay have also certain wind driven recirculation patterns:

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Again what is meant by certain? I think vague statements should be avoided in the abstract.

Line 63: One can increase the number of examples : rephrase

Line 131: turns to the direction to: rephrase

Line 133and other branch complete the cyclonic circulation in basin wide: rephrase

Line 135: Instead of being vertically homogeneous, it is almost horizontally homogeneous; but vertically stratified water column changes the behaviour of the current during summer: rephrase

Line 138 - 140 : rephrase

- Line 161 : the certain layers : what does certain mean here?
- Line 163 : It is preferred to explain the current system : rephrase

I also suggest to change these sentences as follows:

- Line 3: wind is the most important driving-force (instead of driven-force)
- Line 14: Change "Lasting strong wind" to "Strong consistent wind"
- Line 33: The water input through Gediz River is relatively low (instead of small)
- Line 77: In (the) present study (add article)

Line 80: omit "the information"

- Line 94: reaches a plateau (omit to)
- Line 110: omit "which were done"
- Line 110: "deals with" : change to "focuses on"
- Line 135: "comparison to" : change to "compared to"

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