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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 #1

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General comments

The manuscript "The dynamics of Izmir Bay under the effects of wind and thermohaline forces" presents results obtained by a general circulation model (GCM) which has been set up up to study circulation of the Izmir Bay/Aegean Sea under varying forcing. The experiments are set up using a) different kinds of artificially generated wind fields and b) the influence of "thermohaline forces" is studied by initialization with temperature and salinity fileds obtained from observational campaigns representative for a summer and winter case study. The Izmir Bay has not received so much perception in the oceanographic community, so I think this study has the potential to present a step forward in Izmir Bay / Aegean Sea research. However, there are several shortcomings in the presentation of results and open questions about experimental strategy and the

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general motivation for the study that prevents me from supporting the publication in its present form in Ocean Science.

1) I think but it should be mentioned more prominently the Izmir Bay is relatively unexplored region compared to other regional areas and that available reanalysis data sets and observational data sets to initialize the model are not appropriate for that region. This justifies the more conceptional approach of the current study.

2) What is the motivation to apply this model to this research area. What is the advantage compared to previous approaches to model that region.

3) What is the motivation the study circulation of the Izmir Bay. Why is it important? There are only a few hints in the manuscript distributed at several places.

4) The methods section lack fundamental information about the experimental setup and strategy: How long was the model integrated for each experiment. There are results shown for winter and summer. Are this different experiments or were the summer experiment initialization with circulation regime of the winter experiment? What was the motivation to use the artificial wind fields that were used to force the model. Are there some related to a predominant wind direction over the area. Do they represent a spectrum to cover the main probable directions? When no meteorological information is available this should be explicitly mentioned.

5) The results and discussion presents several a number of different characteristic circulation patterns. The authors should avoid here to remain on an exercise level. Which are the structures and currents that important with respect to the general scientific question of the study? Which structures are important for water mass transfer. Which might be important for sediment transport and coast forming processes (if there are some!). What might be important for biology and ventilation. In its present for its hard to read and one wonders what is the main point here.

6) As I understand, no further mass and energy fluxes (except momentum) at the air

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sea boundary were applied. A discussion of how this influences the results would be helpful (especially for the thermohaline case study). Also is the freshwater discharge of the Gediz river accounted for in the simulations? Would be good to know to get insight into the baroclinic behaviour and eddy generation near the river mouth. I Specific comments

line 6: "thermohaline forces". Be more specific, what is the physical force? line 10: two layered"" and "horizontally shared " is very vague and hard to understand line 14: I suggest to reformulate this sentence. line 24: I suggest the term silt sediment or silty deposits rather than silt 25 what is mean by physical characteristics? topography water masses? 28: "silting process" do you mean the continuous filling of the Bay by riverhine sediment loads? I think its not so important for the study whether it is sand, silt clay or muddy material 29 "used to join" - formerly? 35-36 sedimentation accumulates? sediment loss at the bottom due to dissolution, erosion or whatever. Be more precise with what you want to express. 41: when you distinguish different types of water then a few words to characterize the types would be helpful.

43 transport processes through vertical sections. Is there already something known about the renewal time? Mabe in Sayin 2003? then report this here. Later in the MS you present no volume transport calculations to give support for this.

53-66: Several previous studies are mentioned here. The outcome and results for the circulation should be referred a bit more verbose. Which question are still open and which of them do you want to address here with your model. Example: ".Eronat & SayÄśn (2014) studied on the temporal evolution of water characteristic..". But the the reader get not any further information about. If this study is of interest for reader without knowledge on Izmir Bay oceanography you have to give more information.

79 -87: So what is the advantage of this model compared to previous model approaches ? why do you think currents are better represented with this model? Figure

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2 shows results for summer and winter for a westerly wind regime. Why westerlies are chosen, how is this wind generated to force the model. What was the reason to chose 5m7s winds at constant rates? Related to observation or theoretical considerations? What is about the model topography, did you use at established data set for this , do you you a flat bottom? Please be more verbose with what you have done to obtain the results. How long were the individual simulation integrated? This is important information.

So is there no heat or water exchange with the atmosphere in all the experiments? Is that right? if so how would this influence the results for the thermohaline circulation. Is the Gediz river water discharge represented in the model? I think this would be important for the discussion of the thermohaline experiments (baroclinic eddy generation etc...) Figure 2: is this the depth averaged salinity and temperature or the first level? what is exactly shown? Please also tell the reader how the CTD measurements are brought onto the model grid? Which is the number of observations that go into the model? Is 30, 300, or 3000. A profound oceanographic analysis of the observations you used would be also a result to present here (if not elsewhere. Is it in agreement with the distinction of the water types you did above?

120: Please indicate this bifurcation during summer in Figure 3. Its hard to see from the description alone

125: " it is almost horizontally homogeneous; but vertically stratified water column changes the behaviour of the current during summer. " Hard understand what is meant here.

145: "The current." what is this certain speed that sets up the this current? 147 Didn't you say previously that you used a constant wind speed of 5m/s. Please give information about how you forced your model. Which was the max. speed?

150ff: Ok you used several kinds of wind directions. Is there something known about what is the main predominating wind direction during the seasons. If so then give this

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info and the source.

You describe many different circulation patterns here, but it is not really clear what we can learn from that for the Izmir Bay oceanography. Is there any observational support for this. Or is the existence of the modelled currents any further implications for biology and possible implications sediment transport or so. Otherwise, the article turns of as a more theoretical exercise.

175: "Sometimes...". Is there any explanation for that these features combine sometimes, and sometimes not? Or do we interpret here simply stochastic behaviour? Which is the message the reader could keep in mind here?

The conclusions read very similar to what was mentioned already in the results discussion. Here would be the place for broader implications of the results. What would be the effect of the found recirculation patterns and eddies. How would they act to mix water across the different water types. What would be the implication for biology. Do the results support features from biologists or geologists? Can we draw conclusion for hazardous instances ? The work was apparently supported by the Izmir Marine Research Project. Can we find here some motivation for the study.

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