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Ocean Science
Discussions

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

Anonymous Referee #1

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The manuscript is a generally well-written study about the Turkish Strait system. The manuscript has potential, because it completes some other studies and provides an overview on the general circulation in the Marmara Sea. However, it has some shortcomings hat have to be addressed before the manuscript can be published.

General comments:

How is the wind stress and pressure gradient in the BS dealt with? If you do not have the whole basin, the influence of these forces might not be represented well in the area that is part of your domain.

The boundary conditions are prescribed in a strange way. Authors claim to use a buffer

zone to relax salinity, but then they use a time scale of 2 days. This is, for a large basin like this, basically equal to imposing the salinity.

Validation is not strict. Authors show that they get the orders of magnitude right. But this is not a real validation.

Authors talk a lot about wind forcing, but it is not clear if pressure gradients are also accounted for. Authors also use a correction term in order to conserve mass and salinity. However, as I have understood, they applied this correction term at every time step. This means they do not allow for variations in mass and salinity in the basin. However, I guess that the Danube discharge will lead to a variation of these parameters. So, these variations are completely suppressed. I think the authors will have to come up with another scheme that allows for variations and corrections are imposed in the long run.

The biggest problem for me is with table 4. If I check the difference between ingoing and outgoing fluxes at the Bosphorus, I get a volume difference that corresponds to about 8 meter of water level per year. This clearly cannot be. Authors should check their data and carefully check the volume balance.

Specific comments:

1,3 interface where?

3,22 differ from what

Fig 1 does this show the whole model domain?

5,14-16 how is the salinity of BS and Med kept on a constant level?

5,24 is evaporation considered?

Table 1 please define R and S

7,3 runoff is imposed ,right? Salinity is relaxed in the buffer zone? Why not prescribe

it on the boundary? A relaxation time of two days is practically equal to imposing this value. By the way, what about the other closed boundary, the Mediterranean? How has this boundary been handled?

Fig 3 the units for water fluxes need clarification. They are probably m**3/s per m**2, but this might not be obvious for the reader (it was not for me).

8,1 Q_H is positive when? From atmosphere to ocean?

11,4-7 I would like to point out the problem with T after 6 years of integration in deeper layers. As can be seen from figure 9 the lower layers have warmed up by nearly 2 degrees. What is the explanation for this behavior?

Fig 11 when you discuss wind forcing, you should also discuss atmospheric pressure forcing. What about pressure gradients over the same period? I guess pressure is included in the model equations, right?

13,1-2 wind forcing is not the only responsible for sea level fluctuations. Did you look in the pressure variations?

13,7 why excluding pressure forcing?

Table 4 The net flow should be really exactly the same for the northern and southern location. If I assume the length of the Bosphorus with 30 km and its average width with 3 km, I get an area of 100 km**2. The net flux difference between northern and southern sections is 0.8 km**3. This would correspond to an 8 m water level difference over one year. This clearly cannot be true. So what is wrong with this calculation? The way you compute fluxes, or your numbers? Please clarify.

17,5 also normalized by the density

17,10 eq. 3 has no right hand side. . .

18,1 is this total kinetic energy, or only the one caused by wind effects?

19,8 ?????

Appendix:

A1 diffusion term. Sure about the 4th derivative in the term with A_h? Ok, you use bi-harmonic diffusion.

24,2 what about unstable stratification? Can you resolve problems arising with this small vertical diffusivity?

24,13 what does it mean, normalized to the buffer zone?

26,10 I do not understand: you compute the correction term at every time step? So you do not allow the model to become more or less saline during special events (spring river run off, etc.)? I would have done this computation on a mean (maybe annual) value. You clearly do not want a drift of salinity, but variations should be allowed

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