

***Interactive comment on “Calculating the water and heat balances of the Eastern Mediterranean basin using ocean modelling and available meteorological, hydrological, and ocean data” by M. Shaltout and A. Omstedt***

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Dear Referee 1 Thanks for your comments on our manuscript: “Calculating the water and heat balances of the Eastern Mediterranean basin using ocean modelling and available meteorological, hydrological, and ocean data”. In general we find several of the comments good and useful and will respond to them one by one below. We fully agree that our modelling approach is a very simplified. However, we believe it is a useful start when analyzing the Mediterranean basin and we will later treat the dynamics in the different sub-basins in more details. As you stated a lot of data needs

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to be considered and our approach was to put together the meteorological, hydrological and oceanographic in a systematic way.

Major Items 1: The Equation illustrates that we are dealing with turbulence generated by transient Ekman flow and density effects. For example evaporation will destabilize surface water and increase mixing. The approach is similar to box modelling but we resolve the vertical structure in the box and include in- and out-flows at different depths controlled by the dynamics or geometry (e.g. sill depth). As the in- and out-flows may act on different levels in a sub-basin they generate large scale vertical motions in the sub-basin.

Major Items 2: The dynamics of winter convection and intermediate and deep water formation are of major importance for the vertical circulation and require further modelling work. Our approach will only include the large scale features due to changes in heat and salinity. The turbulence model will capture unstable surface conditions due to cooling and due to evaporation. We are fully aware that this is not enough and deep water convection needs to be modelled in much more detail. However, we will address this later when we start to resolve the Mediterranean into more sub regions. It is however interesting that one can capture many important features of the Easter Mediterranean just by our simplification. As you may realize our next step is to divide the Mediterranean into a two basin model system and investigate the differences between the Easter and Western Mediterranean. This step will be taken before we go into higher resolution.

Major Item 3: The T-S structure illustrates that the model capture the surface properties realistically. In the deeper parts the model indicates less variability then observations. This is due to the coarse model resolution, but the results are not bad. The effects of initial conditions are to describe the initial water temperature and salinity of the Eastern Mediterranean from January 1958 as only two water masses. These parameters will be modified to form third water masses by the effect of cooling and evaporation.

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Major Item 4: The effects of the initial conditions have been investigated below and this is now added to the manuscript.

Major Item 5: Authors explain the geoid uncertainty and how that translates into current uncertainty. Argue for the linear assumption which is a simplification. Redo the Figure 10 and state: Based on your suggestions we have taken away Figure 10c.

Major Item 6. Thanks for the comments and we have added this to the paper including the suggested reference.

Technical items. Thanks for these detailed comments which we have accepted and changed our new manuscript according to your suggestion.

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Interactive comment on Ocean Sci. Discuss., 8, 1301, 2011.

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