

## ***Interactive comment on “A high resolution free surface model of the Mediterranean Sea” by M. Tonani et al.***

### **Anonymous Referee #1**

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Comments on the article "A High resolution free surface model of the Mediterranean Sea" by M. Tonani, N. Pinardi, S. Dobricic, I. Pujol and C. Fratianni

#### General comments:

Authors present a Mediterranean Sea high resolution model, which is used to perform 2 simulations (1) with monthly mean perpetual forcing and (2) with interannual ECMWF forcing. Assessment of the 2 simulations are performed, looking at the water flux correction, the kinetic energy, the total heat flux, the wind stress and wind stress curl, the volume transport across Gibraltar and Sicily Straits, the steric component, and the RMS of the temperature and salinity at 30, 150 and 300m.

The paper emphasize at the beginning that the resolution used is presently the highest

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vertical and horizontal resolution found in a Mediterranean Sea Model. The paper does not, however, emphasize the new insights and improvements due to the high resolution, in comparison with existing lower resolution simulations. This is a key element, which is missing in the assessment of the 2 simulations, that should be developed.

The paper emphasizes as well the use of an implicit free surface parameterisation, which allows the authors to equilibrate the fresh water flux forcing and to compare the model SLA with satellite data. However, authors do not mention how the free surface influences the Med Sea dynamic, in comparison with previous rigid lid simulation.

In summary, authors should emphasize the impact on their simulations of the 2 new elements of their model: i.e. the high resolution and the implicit free surface, and provide elements of assessment showing how those 2 new elements allow improving/changing the realism of the simulation.

The authors also spend too much time in section 2 presenting the equations of the model, which are usual equation from Madec et al. (1998). Referring to Madec et al. (1998) is enough. If you really want to keep some of the equations in the text, please state why (How does it differ from Madec et al. ?). In summary, most of the equations from section 2 should be removed. This is also the case in the other sections, where the definition of the Kinetic energy, wind stress curl and volume transport do not have to be written (unless they differ from what is usually done).

Moreover, the language is often not precise and not fluent. Some sentences should be rephrased.

Specific Comments:

(1) in the abstract, it is said the implicit free surface is used for the 1st time in the Mediterranean Sea. This is not really true, as the Mercator-Ocean global simulation (with data assimilation) is also using the free surface in the Mediterranean Sea. the Mercator simulation is however, not a free simulation, neither a model dedicated to the

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Mediterraenan Sea. It is also said that the free surface enhances the model capability to simulate the SSH variability. This is not demonstrated in the present paper and this sentence should be removed.

(2) line 10 to 15, pp219: It is not true to say that no operational models are available to drive the Atlantic box boundary conditions, as the FOAM, TOPAZ and MERCATOR-Ocean models could provide operational boundary conditions in this area. Please remove this sentence. Which climatology is used for the Atlantic Box relaxation?

(3) line16, pp216 "verson 8.1" : the 8.1 OPA version does not include implicit free surface. It is rather 8.2 that does include free surface (Roulet et al.). Please provide explanation on how you have implemented the free surface in the 8.1 version.

(4) the discussion pp228 is interesting, but hard to read, as the sentences are usually too long and not to the point. please, rephrase some of it.

Technical Comments:

(3) line 7-8, pp220: "These modification...". This sentence should be at the beginning of the paragraph.

(4) line 16, pp220: refer to "Eq. (13)" rather than to "(13)". Same remark is applied to all the references to equations.

(5) line 3, pp221: this sentence does not have any subject. I guess "Eq(20)" is missing at the beginning of the sentence.

(6)line 15, pp221: do not use abbreviation "doesnt" but write "does not". Same remark applies to all other abbreviation in the text.

(7) line 17-18, pp221: "A new...": I do not understand this sentence. please rephrase.

(8) line (3) pp222: please use another abbreviation for the perpetual year experiment as "P" was already used to defined Precipitation earlier in the text.

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(9) equation (24): sensible heat flux is missing in the equation.

(10)line 4, pp223: "re-emitted"

(11) line 11, pp223: typo error for short wave Qs

(12)line 20, pp223: do not give definition of Kinetic energy as it is a common knowledge. do not use KE acronym, as it adds confusion to the text. In general, try not to use too many acronyms. same remark for wind stress and wind stress Curl where WC and WS acronyms should be removed.

(13) line 7 pp224: "could be considered " as"

(14) line 8 pp224: "sections", "WE" "show..."

(15)line 11, p224: figure 4 and not figure04. Later in the text, use "figure" instead of "fig"

(16)line 13, pp224: "does has"...2 verbs, one too much!

(17) line 17, pp225: "with respect" "TO" . In the sentence " the 1st 3 year", please state whether this apply to (I) or (P).

(18) Top panel of figure5 is not commented. only middle and lower panels are used. please remove top panel in Fig5.

(19) line 15 pp225 "sector and positive"...you already said just before it is positive. rephrase.

(20) line 19, pp225: "with large departure" from what?

(21) line 10 pp225: "we might say" this is not precise scientific language. same for "more or less" line13 pp226. same for "ca" line 1, pp226. It should be replaced by "approximately" or ""

(22) line 1 pp226: please specify how many grid points of the model you have to resolve the Gibraltar strait.

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(23) line 2 pp226 "have " "BEEN" "developped"

(24) line 14 pp226: "It's not evident...": I do not understand the english, please rephrase.

(25) line 10 pp226: capital letter for March.

(26)line 19 pp226: replace "how much" by "that"

(27)line 20 pp 226: replace "then" by "than"

(28) pp226,line 20: I do not see the WS in figure 7, only WC.But you comment it in the text. please change figure7 accordingly.

(29)line 3 pp227 "transport" not "thansport"

(30)line 5 pp227 "and for values..." please rephrase as I do not understand the meaning.

(31)line 8 pp227 "seems..." this is not precise scientific language.

(32)line 8 pp227: "which" instead of "wich"

(33)line 11 pp227: you compare model with satellite, no the other way round. please rephrase.

(34) line 5 pp228: "coming" "TO"

(35) line 13, pp228: you place the thermocline at 30m. I guess you are talking about the seasonal thermocline, not the permanent one. Please, precise. use "larger" instead of "bigger".

(36)line 18 pp228: "which oscillation..." rephrase as I do not understand.

(37)line 9 pp229 : " even do"..."EVENTHOUGH"???

(38)line 10 pp229 : "improved"???" instead of "performed"

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(39)line 13 pp228 : "deep" what do you mean by deep? 30 meters deep?

(40)line 14 pp228 : WITH respect TO

(41)line 21, pp230: RoseNstein

(42)For all the figures, captions should be rephrased as some information is missing. provide units as well. provide a) b) c) separation if many panels. Fig 5,7,9, and 10 are too small, and the legend barely readable. Figure4: provide the same X axis for the 2 panels (years). Figure2: provide X axis in english, not italian.

(43)line20, pp216: please remove sentence " this impelementation is named MFS1671" as the reader do not care about this information.

(44) line 3 and line 4, pp200 "larger" instead of "bigger" same for line 13, pp228.

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Interactive comment on Ocean Sci. Discuss., 4, 213, 2007.

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