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Ocean Science
Discussions

Interactive comment on "Numerical simulation and decomposition of kinetic energies in the Central Mediterranean Sea: insight on mesoscale circulation and energy conversion" *by* R. Sorgente et al.

Anonymous Referee #1

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General comments

The paper deals with the circulation in the Sicily region using a very high resolution model results.

The paper is well written and generally easy to read. The review of previous works is well done. The decomposition in MKE, EKE, etc, terms is an interesting approach. New insights concern the description of the Atlantic Tunisian Current and the mesoscale features in the Sicily Strait rather than the Central Mediterranean, so the title maybe be

changed.

I recommended the publication with moderate/major revisions, because some points have to be explained in more details and some figures have to be completed. See below the specific comments and correct the typographical errors.

Specific comments

P9, line 0-22: You have to draw the known features Adventure Bank Votex, MCC, ISV, MRV, etc in Figure 2. You may also add the new features you find in your model like the Pantelleria Vortex (PV introduced in section 4.2.2) in dotted circles for example. It will be nice to distinguish on this figure the cyclonic and anti-cyclonique features with an arrow for example.

P12, line11: I think it is S and not S* in the sentence: '. . .R is the river runoff and S* is the surface model salinity. In our. . .

You can remove R if it is zero in the formulae

Describe what is alpha, H, Delta in C_2?

Give the units of these terms.

What is Med6?

P13, top: Is the volume of the model conserved? Give some details on the boundary conditions (radiation, prescribed with the coarser model results?)

Section 3.2:

P15,line16-18: I did not well understand what you mean by 'the grid point whose depth . . ..has been excluded'. It corresponds to offshore areas where the total depth is very huge and then the first sigma layer thickness is larger than 1m. So these areas are not really in the Central Med.?

Another point that could perhaps be a little more explained concerns the wind stress

work. What is its significance? I understand that it allows looking at the relation between the wind and the current. Can you shortly explained some cases or give an example of Ws when the current is in the same direction of the wind or against the wind or orthogonal to the wind? Is there some relation with the surface Ekman transport? It can help the understanding of the description made in section 4.2.2 (page 22 line 4) in the Sicily sub-region for example.

Section 3.3:

You use AVISO $\frac{1}{4}^{\circ}$ resolution SLA. It is relatively a coarse resolution for the Central Med. Maybe you could look at a better product of 1/8° resolution at (http://www.aviso.oceanobs.com/)

Section 4:

Poulain and Zambianchi (2007) used only 60% of drifters drogued at the surface. Maybe you have to explain a little their product because I am not convinced that it is comparable with the average layer of 5m thick.

Section 4.1:

P17, line25: What is the diameter of the Sidra Gyre, is it a cyclone or an anticyclone?, can you show it on Figure 2 as well as the ABV, MCC, etc

Section 4.2:

P19: can you try to explain your choice for the sub-domains of EKE-MKE-etc calculations. Can it be related to the general patterns of the circulations in this area? I propose to merge the figures to allow an analysis of the connexion between the different areas. It is not easy to look separately to the figures. I propose that Figure 5 shows 5 sub-figures (a) TKE, (b) EKE, (c) MKE, (d) log(EKE/MKE), (e) Ws, and inside each sub-figure should be drawn the corresponding time-series for the 4 areas. This approach is already partly done for the last part of the paper but should appear here too. Then when you start the description of the Sardinia-Tyrrhenian sub-region in Sec-

tion 4.2.1 page 20, it will be easy to see/believe that 'P20, line1: A appears as the most energetic area of the four' before it is not possible to see it in present Figure 5. It could also allow some synthesis of the descriptions of Section 4.2.

Section 4.2.1:

P21,line20-21: You writte 'It seems to be part of a large anticyclonic gyre located on the southern side of the Thyrrenian sea'. Can you confirm if this gyre is really present in the coarser large-scale model (show a map for example) to be sure that it is not a problem coming from the boundary conditions? Is it a permanent feature (during the 2-year period)? What is its diameter? Is it a different structure than the seasonal circulations described by Artale et al. (1994)? Finally, choose between a gyre or a current to describe this WNSC.

Section 4.2.2:

P22: See the previous comments to add PC in Figure 2 and a more detailed explanation of Ws.

P23: I found very nice the comparison to satellite data highlighting the presence of PV.

Section 4.2.3:

P23: I am surprise of the low value of the wind stress work because the bathymetry is not deep so should not constrain the circulation and thus I expected seeing a high impact of the wind on the surface circulation. Maybe I have not well understood the Ws significance again. Or maybe is the circulation on the plateau more linked to the winds in another area.

Section 4.2.4:

The circulation in the southern part looks very complicated and it is interesting to look at your results in this area. But (P25) it is not clear if there are currents or just filaments around mesoscale eddies. A current has a vertical shape in velocity. Can you verify

that you are really spoken about current?

Conclusions

Any comment on the wind stress work. The connexion between the ATC and the ALC is not evidenced by surface current analyses. Maybe the authors could look at depth if the ATC is still present and can become the ALC when reaching the Libyan coast. Sometimes stratification seasonal changes can affect the surface current signature.

References

Add Herbaut et al. (1998)

Figures

The latitude and longitude values are not visible and the character size has to be increased. The colorbars are to much close to the sub-figures. And the sticks on the isocontours are not lisible.

Figure 2 : Precise what are the full and dotted lines. The 'ALC' and 'SEGC' word/stick are not in the Figure but in the legend. see also the specific comments to draw the mesoscale features MCC, ISV, etc.

Figure 5: add 'panel C, the logarithm of EKE/MKE (phi) and its unit

Figure 6: remove 'The monthly . . .5 m depht'. Add what is the month (November I guess). Area with 'EKE' (remove 'MKE and' EKE) larger than '100' (remove '80') ...

Figures 9 and 12, 14: similar comments as for Figure 6

Figure 10, C: the colorbar seems to be in meter not in cm as written in the legend. The colorbar are not the same for panels C and D. Maybe the model results can be shift by 0.01m if it is mentioned in the legend to better see the features.

Figure 12: EKE larger than '60' not '80'

Figure 13: Lybian sub-region.

Figure 17: where is the colorbar?

Word choice and typographical errors:

Choose between eastern sub-basin or basin, again for the western Mediterranean

P3, line 2: eastern and western Mediterranean sub-basins

Compared to

P6, line 10, line 20: Mediterranean basins

I think the unit is kg and not Kg for kilogramme (see p 11 for example)

Section 2.1:

P6, line 6 Béranger

P6, line 11: (AW) remove hereafter, it is a standard

P6, line 12: 2-layer without s

P6, line15: outflow not Outflow

P6,line21: intense current, not intensity

Section 2.2:

P7,line6: few-kilometer long

P7,line15: 2001Âă; Onken et al., 2003Âă; Béranger et al., 2004Âă; Herbaut et al., 1998).

P8, line 17Âă: Sorgente et al., 2003Âă; Béranger et al. 2004)

P8, line 22Âă: lower frequency signals

Section3.1Âă:

P10, endÂă: 5-day forecasts by Gabersèk

P11,line2: negligee

P11,line6: Flux computation

P12:line10: 'P is the precipitation rate from the monthly climatology of Legates and Willmott (1990)' seems more clear than 'P the monthly precipitation rate obtained from Legates and Willmott'

Section 3.2:

P13, line5: By taking into account

P15, line4: the two forms of eddy

Section 4.1:

P16,end-P17line1: described by Zavatarelli and Mellor (1995), Robinson et al. (2001), Astraldi et al. (2001, 2002), Onken et al. (2003) and Béranger et al. (2004).

P17Âă:line4Âă: . . .Bank. The AC splits in

Section 4.2:

P19, line11: Figure 4 not 'Figs.4

P19, line21-23:remove 'but is probably . . .section 4.2.1'. You do not know at this step so you will show it latter.

P19,end: remove 'and ratio. . .)'

Section 4.3:

P23, line15: Béranger

Section 5:

Remove 'Summary and Conclusions'

P30: Gerin et al. (2009)

References

Béranger et al. 2004Âă: 'Gervasio' not 'Gervaso'

Drago et al.Âă: 'Malta' not 'malta'

Gerin et al.Âă: '2005-2007' not '20052007'

Hellerman and Rosenstein: 'over' not 'oce'

Lermusiaux 1999: 'Dyn' not 'Dynam'

Millot 1999: 'Mar. Syst' not 'Mari. Syst'

Robinson et al. 1999: 'Stream' not 'Stram'

Robinson et al. 2001: 'Theocharis' not 'Thecharis'

Interactive comment on Ocean Sci. Discuss., 8, 1161, 2011.