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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A coupled wave-3D hydrodynamics model of the Taranto Sea (Italy): a multiple-nesting approach" *by* M. G. Gaeta et al.

Anonymous Referee #3

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General recommendations:

The present manuscript describes the implementation of embedded multiscale modelling systems in the Taranto Sea to refine predictions of hydrodynamics components (significant wave height, sea levels and currents) in the Mar Grande area. This research study provides, in particular, further insights about capabilities of a multiple-nesting method to improve numerical predictions at the local scale of harbor basin which requires generally improved temporal and spatial resolutions. Of particular interest is the availability of numerous in-situ measurements in the area considered. Nevertheless, strong differences are exhibited between observations and results from

the three-dimensional (3D) model in the Taranto Sea, particularly noticeable for depth-averaged velocities at the Mar Grande station. In addition, the manuscript focuses a bit too much on the comparison between predictions and observations neglecting a depth discussion about the hydrodynamics of the Mar Grande studied area. For these major two reasons, I suggest major corrections of the manuscript before publication in Natural Hazards and Earth System Sciences (NHESS). Improving the discussion will undeniably increase the potential of this very interesting research study. In order to help authors to review the manuscript which research deserves to be published in NHESS, major and minor comments are detailed in the two following sections.

Major comments:

1- On the basis of Figs. 11 and 12, it was concluded that the "combined effects of (i)...have led to a better representation of the circulation regime inside Mar Grande by the proposed modelling approach" in comparison with SANIFS predictions. But "this better representation" does not appear so well on these two figures. Indeed, the present modelling system predicts higher amplitudes of velocities than SANIFS reducing initial differences with in-situ measurements (Fig. 11). Nevertheless, strong differences still remain. In particular numerical results from TEL3D+TOM are found to overestimate observed velocities by 50 % on 6 October 2014. Taking into account these differences, it is very difficult to conclude that "the overall agreement of computations is quite good" here. What is more, whereas predictions from TEL3D+TOM provide better representation of daily-averaged vertical profiles of current at the Mar Grande station on 6 and 7 October 2014, a better agreement appears to be obtained with SANIFS on 5 October (Fig. 12). Extending the evaluation of both models predictions with additional measurements will confirm the better assessment of TEL3D+TOM in the studied area.

2- Whereas the evaluation of models predictions is of major interest in this research study, significant improvement of the quality of this manuscript will be gained by extending the discussion of results obtained here. For instance, numerical predictions may be exploited to gain further insights about the hydrodynamics of the Mar Grande area exhibiting major forcings and the dominant interactions including effects of currents on waves. Indeed, this latter aspect is not really discussed for the presentation of results in Fig. 6.

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Minor comments:

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p. for page and par. for paragraph

p. 1 – l. 26 = of tide and wave energy...

p. 2 – l. 3= You may add a reference about embedded models such as Guillou, Chapalain and Duvieilbourg (2013). Sea surface temperature modelling in the Sea of Iroise: assessment of boundary conditions. Ocean Dynamics, vol. 63, Issue 7, 849-863.

p. 2 – l. 7 = was furthermore the subject of numerous studies...

p. 2 – l. 10 = Holthuijsen, 2007

p. 2 – l. 10 = Are all the references cited compared predictions with in-situ observations? I am not sure of it. You may only include references which exhibit such comparisons (for instance, effects of currents on the significant wave height...).

p. 2 – l. 15 = temporal resolutions...

p. 2 – l. 19 = Guillou and Chapalain, 2012

p. 2 – l. 28 = in terms of wave forcings = only wave forcings ?

p. 3 = Please add references for TOMAWAC, TELEMAC2D and TELEMAC3D.

p. 3 = The last sentence has to be reviewed. It it not clear whether TELEMAC 3D is driven by predictions from TELEMAC2D or not.

p. 4 – l. 3 = to arrive to = to reach

p. 4 – l. 3 = The spin-up time does not really decrease with the increase in spatial and temporal resolutions but with the scale of the computational domain considered.

p. 4 – l. 12 = Please add a reference about the equation solved by TOMAWAC.

p. 4 – l. 30 = Do you consider effects of wave and current bottom boundary layers ? In particular effects of the apparent bottom roughness felt by the current above the wave boundary layer ? See Grant and Madsen (1979). You may add a comment about it here.

p. 5 – l. 28 = Nautical charts are often corrected to overestimate shallow waters areas. Is it the case in the present data?

p. 6 – l. 2 = I do not see the black circle in Fig. 2.

p. 6 – l. 22 = Not black circles but blue for locations of CTD measurements.

p. 7 - l. 4 = The Crotone station does not appear in Fig. 1.

p. 7 – l. 7 = What are the formulations retained for whitecapping dissipation and dissipation by bottom friction in TOMAWAC?

p. 7 – l. 8 = time step of COSMO wind data?

p. 7 – l. 18 = Wind drag coefficient and bottom friction appear to be corrected only for TEL2D and not for TOMAWAC. Please confirm it clearly in this paragraph.

p. 8 – l. 4 = well the tidal constituents...

p. 8 – l. 10 = What about the effects of currents induced-refraction on waves ? How do

you know that tidal flow induces steepening of waves here?

p. 8 – l. 24 = follows and following

p. 9 – eq. 1 = I will not display equation 1.

p. 9 = I will not specify the names of subroutines modified in TELEMAC.

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