RESPONSE TO REFEREES & REVISION DETAILS

Journal: Ocean Science

Ms. Ref. No.: os-2015-15

Title: Simulation of tsunami generation, propagation and coastal inundation in the Eastern Mediterranean.

Authors: Samaras, A.G., Karambas, Th.V and Archetti, R.

Note: Page/Line/Figure numbers in the fields "Response" and "Revisions in manuscript" refer to the revised version of the manuscript.

Anonymous Referee #1

Very well presented paper, with adequate references to the existing bibliography, formulating and applying an advanced nonlinear wave model for the description of tsunami generation and propagation.

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1 - A comment is worth, regarding the tsunami generation process, described as active and passive one. The two approaches, one at the bed level, the second at the free surface level may not lead to the same initial wave , depending on the generation time T and the local depth h (and consequently the local wave celerity C=(gh)1/2). Although the authors make use of formulae (16), and (17) for the selection of the axes of the tsunamigenic region, implicitly selecting an M value (in Richter scale?), they use an ideal wave amplitude ζo, although they could use (18) for the real value. Is it necessary?

Response: The "passive" mode for tsunami generation was selected in order to comply with the rationale of the model applications presented in this work, considering earthquakes that would generate a normalized wave amplitude of ζ_0 = 1m. As also noted in the manuscript, the essence of the presented applications lies in testing the capabilities of the developed model and methodology for real case scenarios of operational interest in the Mediterranean; not in replicating single tsunami events, for which, furthermore, accurate inundation data would not be available. Accordingly, the introduction of the displacement directly on the free surface served exactly the purpose of avoiding any ambiguity regarding the actual surface displacement an eventual 1m bottom displacement would result to; M, L_{major} and L_{minor} were calculated using Eqs. (18), (16) and (17), respectively and in succession, for ζ_0 = 1m.

Revisions in manuscript: -

Anonymous Referee #2

This paper illustrates the application of a Boussinesq model, complemented by a tsunami generation model, for the analysis of the evolution of earthquake-induced tsunamis in the Eastern Mediterranean. Specific focus is in the analysis of tsunami waves evolving around the islands of Crete and Sicily.
The topic of the paper is clearly of interest for the readers of Ocean Science. However, improvements are needed prior that final publication be granted:

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1 - Section 2.1. In view of the scope of the paper, the introduction could refer to the recent works of

M. Antuono, V. Liapidevskii & M. Brocchini (2009). "Dispersive Nonlinear Shallow Water Equations." Stud. Appl. Maths. 122(1), 1-28.

M. Antuono & M. Brocchini. (2013). "Beyond Boussinesq-type equations: Semi-Integrated models for coastal dynamics" Phys. Fluids 25, 016603, doi: 10.1063/1.4774343, 21 pp

which provide significant improvements with respect to typical Boussinesq-type models for both numerical solution features (Grosso et al., 2009) and the overall flow structures (Antuono & Brocchini, 2013).

Response: -
Revisions in manuscript: Literature review regarding Boussinesq-type models revised (**Section 2.1 / Page 4 / Lines: 13-16**); references added in **Section "References" / Page 12 / Lines: 2-3, 4-5** and **Section "References" / Page 13 / 17-19**.

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2 - Section 2.3. The model validation is the weakest part of the paper: a model used for 2DH simulations has only been validated by means of one simple 1DH test. A number of 2DH tests are available in the literature for this sort of benchmarking and at least one of them should be used for evaluating the present model performances. This is crucial with specific reference to propagation and inundation dynamics over complex topographies, like those analyzed in the rest of the paper.

Response: -
Revisions in manuscript: Validation through comparison with the three-dimensional experimental data of Briggs et al. (1995) added to the revised manuscript: **Section 1 / Page 3 / Lines: 24-26**; **Section 2.3 / Page 7 / Lines: 16-18**; **Section 2.3 / Page 8 / Lines: 8-27**; **Section 5 / Page 11 / Lines: 14-16**).
Tables 1 and **2** added in **Pages 16** and **17**, respectively.
Figures 2 and **3** added in **Pages 19** and **20**; Figures in the original submission renamed and all in-text references appropriately modified.
Reference added in **Section "References" / Page 12 / Lines: 17-19**.

Anonymous Referee #3

The manuscript presents an exhaustive quantitative and qualitative application of fully nonlinear model for the 2-DH simulation of the earthquake-induced tsunamis evolution. The authors use an application of a Boussinesq model, complemented by a tsunami generation model. This is a crucial topic, of safe interest for the readers of Ocean Science. The article presents original and relevant results and uses the appropriate approach. It is clear and sensibly arranged but there is one issue to be solved before the article can be accepted for final publication in Ocean Science.

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1 - The model presented in the manuscript is a 2-DH and deals with both breaking and non-breaking waves. The authors use the experimental data of Synolakis (1987) to test the model's capability in representing swash zone hydrodynamics but the Synolakis' analytical model is a 1-DH model and it has been developed for non-breaking wave run-up. Nevertheless, due to the complex nature of the fluid motion during the process of wave breaking, and due to the complex topographies (as the two zones of the Eastern Mediterranean taken in consideration in the chapter 3) I see the need to validate the model performances presented in the manuscript with a similar 2-DH test available in literature. This point would certainly give more significance to the scientific method presented in the manuscript as well as would make the results substantially more clearly defined.

Response: -

Revisions in manuscript: Validation through comparison with the three-dimensional experimental data of Briggs et al. (1995) added to the revised manuscript: **Section 1 / Page 3 / Lines: 24-26**; **Section 2.3 / Page 7 / Lines: 16-18**; **Section 2.3 / Page 8 / Lines: 8-27**; **Section 5 / Page 11 / Lines: 14-16**).

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The authors would like to thank the three anonymous referees for their constructive comments and suggestions.