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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Large-scale numerical modeling of hydro-acoustic waves generated by tsunamigenic earthquakes" *by* C. Cecioni et al.

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I can recommend the paper for publication after minor revision according to the comments in the following.

This is an interesting paper which extends further the original approach of Sammarco *et al*. (2013) on earthquake-generated hydro-acoustic waves, with application to realistic scenarios. The analysis is competent and the discussion provides a stimulating physical insight into the mechanism of propagation of hydro-acoustic waves generated by submarine earthquakes and their interaction with the bottom topography. This paper makes a step forward towards the design of tsunami early-warning systems based on the detection of hydro-acoustic waves. However, I recommend the Authors

to consider the following points prior to publication.

Main Comments

1) The Authors highlight the importance of the bathymetry in affecting the nature (propagating/evanescent) of the hydro-acoustic modes. I would ask the Authors to please provide a brief qualitative discussion on the likely effects induced by an elastic bottom instead of a rigid one, e.g. following the discussion of Eyov *et al*. (2013).

2) Other acoustic-gravity waves are also present in water, generated by the secondary wave-to-wave interaction (e.g. pseudo-Rayleigh and acoustic-gravity waves, see Ardhuin & Herbers 2013), which are different from those considered in this paper. I recommend the Authors to clarify that their analysis involves the first-order effects of compressibility on the simultaneous generation of surface (tsunami) and hydro-acoustic waves. The latter are different from the Rayleigh and the secondary acoustic-gravity waves, which are a consequence of (and not generated together with) surface gravity waves (please see also the discussion in Renzi & Dias 2014).

Minor Comments

1) Labels (e.g. 3D and DI) next to the subplots of figure 4 would help the reader understand better the plots.

2) Please specify that the system (1) is valid within the framework of a linearised theory.

3) The level of English language could be improved. Please replace "associated to" with the correct form "associated with" throughout the paper. Please check that verbs agree with subjects (e.g. line 2 of page 4638: "the simulation cover" should read "covers"; same page: "hydro-acoustic signal do not" should read "does not", and so on).

References

Ardhuin, F. & Herbers, T.H.C. 2013 Noise generation in the solid Earth, oceans and atmosphere, from nonlinear interacting surface gravity waves in finite depth. *Journal of Fluid Mechanics*, **716**, 316-348.

Eyov, E., Klar, A., Kadri, U. & Stiassnie, M. 2013 Progressive waves in a compressible ocean with an elastic bottom. *Wave Motion* **50**, 929–939.

Renzi, E. & Dias, F. 2014 Hydro-acoustic precursors of gravity waves generated by surface pressure disturbances localised in space and time. *Journal of Fluid Mechanics*, **754**, 250-262.

Sammarco, P., Cecioni, C., Bellotti, G. & Abdolali, A. 2013 Depth-integrated equation for large-scale modelling of low-frequency hydroacoustic waves. *Journal of Fluid Mechanics* **722**, R6.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 4629, 2014.