

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC5  
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## Comment on nhess-2021-323

Anonymous Referee #4

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Referee comment on "Mass flows, turbidity currents and other hydrodynamic consequences of small and moderate earthquakes in the Sea of Marmara" by Pierre Henry et al., Nat. Hazards Earth Syst. Sci. Discuss.,  
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### GENERAL COMMENTS

The manuscript presented by Henry et al., can add a substantial contribution to the knowledge of the response of the sediment to moderate earthquakes in a canyon system of a shelf edge in active margins. One of the main findings of this research is obtaining quantitative measurements in real time of the physical parameters (velocity,  $T^a$ ...etc) of the water and sediment flows generated by earthquakes with magnitude between 4-6. The methodology used is novel and can add significant findings to the understanding of flow dynamic related to currents (turbidity or not) triggered by earthquakes.

To really test the value of the flow measurements and main assumptions exposed in the proposed text, it would be very valuable to have sediment cores in that location and check the sedimentological features related to the "events" triggered by the 4.7 and 5.8 earthquakes.

The **introduction** encompasses the main crucial aspects to be considered for this study and it is properly referenced. However, the focus of the introduction may be slightly changed. Paleoseismic studies are based on the synchronicity of turbidity currents triggered by big earthquakes ( $> 7$  Mw) and their deposits down the canyon confluences in basins with a wide extension (even hundreds of kms) of active margins in an abyssal context. See several works from Adams 1990, Goldfinger (2003, 2006, 2007...) and Nelson et al. (2000, 2009...etc), Gutierrez-Pastor et al., 2013 or the Japanese Nakajima et al., 2000 and Shiki et al., 2000.

Here authors are testing generation of "turbidity currents" triggered by moderate earthquakes in an outlet canyon of the continental shelf edge and their hydrodynamic consequences. From my point of view, I would focus on the study of characteristics of

currents triggered by different moderate earthquake magnitudes and think in the possible sceneries (turbidite currents, storms, hyperpycnal flows...etc). I would try to find information in obtained well dated sediment cores in the area and their sedimentological characteristics in relationship with historical earthquakes.

I would separate the **discussion** from the **conclusion**. Conclusions may be very clear in a format, preferably, of bullets with the main new insights and findings.

In general, the manuscript is well written although I propose some suggestions in an attempt to improve the content and shape.

#### SPECIFIC COMMENTS

Lines 37-39: These lines are weakly expressed. I would rephrase them or eliminate in the abstract (maybe include something about it in the introduction, well justified) because here you are comparing small earthquakes recorded just in a proximal site of this margin, with historical big earthquakes (bigger than 7) that trigger turbidites down the canyon confluences in the deep basins.

Lines 57-61: Rephrase this; Actually, seismoturbidites deposit over the hemipelagic sediment below, that represent a quiet open ocean environment. In the way that is expressed look like the hemipelagic is overlying the sandy/turbidite base?? You may specify that the "layer of apparently homogenous mud with small or gradual, if any, variations in grain size and chemical composition" may correspond to the tail of the turbidite. There is a lot of literature to check the seismoturbidites characteristics as for example Gorsline et al., 2000 (Gulf of California), Nakajima et al., 2000 (Japan Sea), Shiki et al., 2000 (in lakes) and the cited Gutierrez-Pastor et al., 2013...etc.

Lines 93-97: As said in a comment above, be careful with comparing seismoturbidites triggered by big earthquakes and recorded in the sediment in wide margin areas with this local turbidite flows measured with an artifact locally. You could focus the study in showing the characteristics of the flows and sediment involved in the triggered current to improve the understanding of turbidite currents generated by earthquakes in proximal sites. This is very valuable to understand the hydrodynamic conditions during and at the time of the deposition, and compare with other records (such as storms, hyperpycnal flows...etc).

Line 114-116: This is extra, eliminate it: "that differ...etc"

Lines 270-281: The beginning of Section 3.2 is not easy to follow. It is very confusing. You

state "main earthquake" (Do you mean the one of Mw 5.8?), "During that event" or during "all three events". You may specify better and express it in a way more under stable.

Lines 381-383: This assumption seems to contradict lines 366 and 367, where you state that speed of less than 4 cm/s may have been insufficient to put particles in suspension. However, here you say that several turbid events are observed.

Line 389: specified the seasonal temperature variability ranges, if possible

Line 422: In this section I miss any table explaining the sequence of events or even a drawing. I suggest to add any table, scheme or draft to improve and clarify the meaning of the events.

Lines 499-501: You should mention here that a sedimentary record would complement the hydrodynamic interpretations and would support your work. Consider that If there is any sediment core in the area that is well dated, you could look for the historical earthquakes of magnitudes between 4-6 and have a look to the sediment corresponding to the date of that historical earthquake. So, you could test if there is turbidites and their characteristics, as you describe from your observations. To me, this is the most interesting point that can add (really) to the Paleoseismology, in relationship with moderate earthquakes in proximal settings. So, measurements of current turbidite currents can help to calibrate what we observe in the sediment.

Lines 512-516: This is not clear. Rephrase.

Line 513: Which velocity?

Lines 521-523: Specify the magnitude of Earthquakes.

Line 534: first time that you mention something about calcium. Please, add any reference.

Line 565: So, there is a core taken in the fan??? Which core, please specify and make the appropriated reference. So, if you have a core and is properly dated, you have opportunity to test what I have suggested in comment above.

Line 570: Please, specified magnitude.

## TECHNICAL CORRECTIONS

Line 320: 5 cm/s. Take out the space

Line 355: change turbidity for turbidity currents

Line 428: ENE? East North East?

Line 449: Here you define "seiche". Revise in the text where it appears for first time and define it there.

Lines 489-491: add a verb "how earthquakes scale influences the hydrodynamic

Line 533: "observatory", Do you mean the instrument?

Line 537: Change earlier by "before".

Line 544: Include "that". The scenario that we propose...

Figure 1: Mark references: North or South and East or West. 1B need labels in the map.

Figure 6. If possible, increase the size as Figures 4 and 5.

Figure 8. Add (O<sub>2</sub>) after oxygen concentration

consequences or conditions...." or change the sentence to better make sense.



