

## ***Interactive comment on “Typhoon Haiyan’s sedimentary record in coastal environments of the Philippines and its palaeotempestological implications” by Dominik Brill et al.***

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Received and published: 27 September 2016

Dear Editor and authors,

The research presented in this paper is a valuable contribution to the documentation of the sedimentary record of storms. Documenting the sedimentary record of Haiyan is critical because it is a very large storm and there is a need for data on erosion and deposition for extreme storms. The scope of the field investigation is impressive and the wide variety of laboratory analyses performed create a large data set that can be used to discriminate storm deposits from tsunami and other high-energy deposits. The figures are informative and well done. I recommend that this paper be published after revision. I suggest possible ways to improve the paper below.

C1

Perhaps because of the amount of data presented I found the paper hard to follow. I suggest two things to help the reader: (1) a table summarizing all the sites visited and their important characteristics [source sediment available for transport, topography, etc.] and Haiyan deposit metrics [inland extent, maximum thickness, number of layers, grain size, etc.], and (2) adding text in the introduction, or in a new section, about published reports on geometries and thickness/grain size trends for storm and tsunami deposits to give context for Haiyan deposits.

I am not entirely sure, but it appears that all the figures use distance along transect rather than distance from the shoreline. This is supported by the text on Page 6, Line 24, “shallow reef outcrops occur at 180 m transect length.” I also measured the distance along transect at Tolosa (Fig. 5). TOL14 is about 120 m inland from the shoreline, but is plotted at about 145 m in Figure 3 and 5. I measured the distance along transect at Tolosa to be about 140 m. Do all the figures use distance along transect rather than distance from the shoreline? If so, they need to be corrected. Distance along transect is meaningless because a change in transect orientation results in a different distance along transect for the same distance from the shoreline, the physically meaningful parameter.

I disagree with the statement on Page 1, Line 20 in the Abstract that Haiyan deposits, “might also function as a benchmark example for a general discrimination between storm and tsunami deposits.” The Haiyan deposits are part of a spectrum of possible storm deposits; however, because of the presence of surf beat creating a tsunami-like bore they may not be typical. If so, although valuable to illustrate the spectrum of possible storm deposits, they may be more atypical than typical and therefore not a “benchmark example for a general discrimination between storm and tsunami deposits.”

A discussion of preservation potential of the Haiyan deposits would provide insight into whether the deposits observed in this study would be found in the geologic record.

C2

Instead of using “geological imprint” in the first sentence of the Conclusions (Page 17, Line 2) use “deposits” because preservation of the deposits is not addressed. Preservation of storm deposits in environments investigated in this study is a rather large topic and worthy of another paper. But, although it might seem like semantics, the “geological imprint” is unknown at this time because whether the deposit will be preserved is unknown and how it will be altered as time passes is also unknown.

Same comment about using “geological legacy” in the next sentence (Page 17, Line 3). I suggest using “deposits” again.

Also in the conclusion is the statement, “the sandy onshore deposits left by Haiyan are very similar to those generated by tsunamis.” Rather than give a qualitative qualifier of “very similar”, which means different things to different people, list the similarities.

In the Abstract (Page 1, Line 3) and Conclusions (Page 17, Line 4) it would help the reader if you clarified what “Extended onshore sand sheets”/“extensive sand sheets” mean. Is there an inland distance that a sand sheet extends inland that you classify as “extended”/“extensive”? Perhaps it would be better to specify how far inland the sand sheets extend. How readers define extended/extensive will vary and it is better to be specific.

Shell fragments are present in the Haiyan deposit at some locations. Grain size is measured by laser diffraction and Camsizer and does not account for particle density or shape, both of which would be quite different for shells than other components and affect their settling velocity and transport in suspension. I suggest discussing how the presence of shells affect your interpretation of the grain size data. Woodruff et al. (2008) address the differences between settling velocities of shells and siliciclastic particles. Figure DR2 in the data repository summarizes their results. The citation for Woodruff et al. (2008) is: Woodruff, J.D., Donnelly, J.P., Mohrig, D., Geyer, W.R., 2008. Reconstructing relative flooding intensities responsible for hurricane-induced deposits from Laguna Playa Grande, Vieques, Puerto Rico. *Geology* 36, 391–394.

C3

<http://dx.doi.org/10.1130/G24731A.1>.

A fining trend in modal grain size is reported for Hernani (page 7, lines 2 and 3; Figure 3). However, the mean grain size trends of Hernani are more complicated. If trends in modal grain size are reported, please discuss how mean grain size trends are different and justify why you assign a “fining landward” trend based on modal grain size.

Are the statistics in Figure 3 for grain size for the entire deposit? That is, are they averages for all the grain size data for deposit? Please clarify for the reader.

Please explain further how it was determined that sediment from the foreshore and deeper water are part of the Haiyan deposit (Page 132, Line 16). Are there grain sizes present in the Haiyan deposit that are not from the beach? Can this be sediment picked-up landward of the beach? Were there samples collected from the foreshore and nearshore close in time to when Haiyan impacted the Phillipines that have grain size data?

What is meant by “a rather normally graded structure of these sand sheets” (Page 13, Line 9)? This is important because grading of deposits may be a discriminator of storm versus tsunami deposition. Were the Haiyan deposit suspension graded, as has been observed for deposits formed by several recent tsunamis and for paleotsunami deposits? (for an explanation of suspension grading see: Jaffe, B.E., Buckley, M.L., Richmond, B.M., Strotz, L., Etienne, S., Clark, K., and Gelfenbaum, G., 2011, Flow speed estimated by inverse modeling of sandy sediment deposited by the 29 September 2009 tsunami near Satitua, east Upolu, Samoa, *Earth-Science Reviews*, v. 107, p. 23-37, doi:10.1016/j.earscirev.2011.03.009.)

Missing reference for Haiyan surf beat: Roeber, V and Bricker, J., 2015, Destructive tsunami-like wave generated by surf beat over a coral reef during Typhoon Haiyan, *Nature Communications* (6), DOI: 10.1038/ncomms8854

Other comments:

C4

Page 2, Line 8- Suggest changing “coastal disasters in the immediate past” to “recent coastal disasters”.

Page 2, Line 15- Suggest ending the sentence after “records” and change the next part of the sentence to a new sentence “This discrepancy is great because cyclones usually follow an inverse power law (Corral et al., 2010).

Page 2, Line 18- Suggest changing “even events of the highest magnitudes” to “large events”.

Page 2, Line 25- Suggest changing “naturaare particularly” to “are”.

Page 3, Line 16- Suggest changing “the significance of seasonality” to “seasonal variability”.

Page 4, Lines 10-18 and later in the paper as well- (i), (ii), (iii) are not needed and are distracting.

Page 4, Line 31- Suggest changing “typically shows” to “is characterized by”.

Page 4, Line 31- Again, (i), (ii), (iii) are not needed in this paragraph.

Page 4, Line 32- The fetch over the Pacific, not the narrow shelf, is the reason that Eastern Samar has high swell waves.

Page 5, Lines 13 and 14- The times of day for the DGSP are not relevant and should be omitted.

Page 5, Line 15- Suggest changing “were recorded by leveling” to “were documented by measuring elevations of”.

Page 5, Line 20- Suggest deleting “directly”.

Page 5, Line 23- Define what you mean by representative. Typical thickness? Typical sediment grain size? Typical structure?

Page 5, Line 27- Chemical formula contain subscripts for the number of atoms for  
C5

elements.

Page 6, Line 17- Is Barangay capitalized?

Page 6, Line 19- Suggest changing “the two tropical storms/depressions recorded between Haiyan and this field survey on January 19th and February 1st respectively” to “the two tropical storms/depressions hitting the Philippines on January 19th and February 1st, respectively, which is after Haiyan and before this field survey”.

Page 7, Line 6- Are the values for grain size in “)”thinning and fining landward from 8 cm and a mean of 570  $\mu\text{m}$  at 130 m from the shoreline (HER 8) to only 3 mm and a mean of 223  $\mu\text{m}$  at 260 m (HER 3) (Fig. 3).” for the mode or mean? It appears from Figure 3 that they are for the mode, but I am not sure because this for Unit 1 and it is not clear what is shown in Figure 3.

Page 7, Line 21- Delete “According to”.

Page 7, Line 22- Suggest changing “bushes, Haiyan” to “are evidence that Haiyan”.

Page 7, Line 30- Suggest changing “Pre and post-typhoon” to “Pre- and post-typhoon”.

Page 8, Line 9 and later in the text- The use of the word “profiles” is not standard. Suggest changing “profiles TOL 7-14” to “trenches TOL 7-14”. This suggestion applies everywhere in the text where “profile” is used to describe a trench.

Page 8, Line 15- Specify what “slightly inclined” means.

Page 8, Line 21- What is meant by “moderate flooding”. I have no idea what is moderate. Please be specific by giving an spatial extent and/or a water depth.

Page 8, Line 25- How thin are the sand patches?

Page 9, Line 1- Delete “single”. It is not needed.

Page 9, Line 1- Suggest changing “in either direction” to “crest elevation”.

Page 12, Line 30- Suggest changing “show comparably large inland extents exceeding  
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100 m” to “extend at least 100 m inland”.

Page 13, Line 13- Suggest changing “dedicated” to “attributed”.

Page 16, Line 21- Suggest changing “confined” to “indicated”.

Page 25, Figure 3- Be consistent with line types in each panel. Sorting is a different line type for HER 3-9 than for TOL 3-14 and BAN 1-3. A minor point, but why not make it easier on the reader to compare panels? Also, a solid line is used for both the mode and mean in different panels. Why not use a solid line for the mean and another line type for the mode?

Page 25, Figure 3- Why does the thickness scale for TOL 3-14 start at -2? This makes it difficult to determine the thickness of the more landward deposits. Why not start the scale at 0 to make it easy to determine the thickness of landward deposits?

Page 25, Figure 3- Why is there a vertical dashed line at 40 m in the TOL 3-14 panel? Please explain this line in the caption.

Page 25 Figure 3 caption- The mean grain size of HER 3-8 doesn't monotonically fine landward. See earlier comment on mode versus mean and description/definition of landward fining.

Page 29, Figure 6- For consistency, add the column that indicates grading by the shaded triangles.

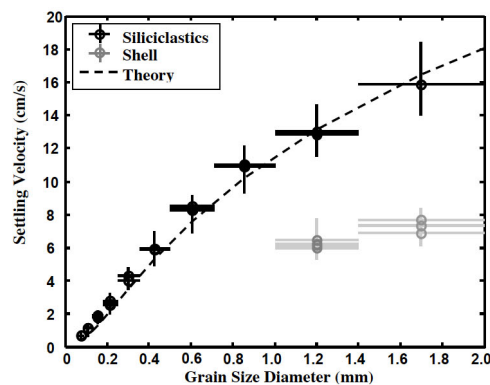
Page 29, Figure 6 caption- The transect is not coast-perpendicular.

Page 33, Figure 10 caption- The transect is only shore-perpendicular for trenches 1 and 2, not trench 3.

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-224, 2016.

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**Figure DR2: Grain size versus settling velocity for LPG sediment.** Mean settling velocities ( $w_s$ ) measured for siliciclastics (black circles) and shell material (gray circles). Vertical error bars indicate  $1\sigma$  range for  $w_s$  and horizontal error bars indicate ranges of grain diameters in each bin size. Comparisons between the actual mean settling velocities measured for LPG siliciclastics sediments and values predicted by Ferguson and Church (2004) for naturally shaped quartz sands (black dotted line) reveal an excellent fit and support using the relationship for analyses in this study.

**Fig. 1.** Figure showing difference in settling velocity of shells and siliciclastic material (Woodruff et al., 2008)

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