

**Reply to Referee 1, Pedro Costa (NHSS)**

**Interactive comment on “Reconstruction of flow conditions from 2004 Indian Ocean tsunami deposits at the Phra Thong island using a deep neural network inverse model” by Rimali Mitra et al.,**

We thank the reviewer for the critical assessment of our manuscript and for the numerous comments and suggestions. We have provided answers to your questions as listed below (in bold italics).

Q1: The Science is there but English must be revised extensively and above all there must be a clear clarification on how and what exactly field data was used to validate the model. I believe you used Fujino et al. (2010) data but sometimes when reading the manuscript, one feels puzzled to confirm that you did use it and which values have you used it. For instance, thickness, grain-size curve, etc. Therefore, I cannot agree with the title proposed because it was not well-established that the regressive model used geological data. Sometimes the reader feels, the models fed and validated each other, and no solid, extensive and accurate field data was used. I assumed that this might just be a language and writing problem. Even if it is that, you need to address it. Sometimes the text is confusing and one wonders what you trying to transmit. For example, when you state the model was validated by "observed" flow depths in several locations along the studied profile...in fact, you are saying that the model agrees well with previous modelling exercises for flow depth establishment. The meaning of both sentences is totally different regarding field validation and this is crucial for this manuscript.

***RE: The authors would like to thank Dr. Costa for his comments. We will make a substantial effort on the clarifications and the overall organization of the paper. We have done the English language and grammar checking on our manuscript by an English proof-reading service agency for journals.***

***Yes, we have used the dataset from Fujino et al. (2010) and the dataset is given as “Thai\_gs5.csv” in <https://doi.org/10.5281/zenodo.4075137>. We will add additional diagram on the distribution of the thickness of the samples with the distance along with the mean grain size and segregation of the grain size classes from the distribution. Hence, we decided to keep the same title as it uses the real field data set in the inverse model and the model uses mean squared error for the regression algorithm.***

***Here, “observed” flow depth implies the measured flow depth. We agree that we should unify and recheck the terminologies for all measured values to avoid further confusions.***

Q2: There are many other aspects I raised on the annotated version and I suggest you analyse them critically. I might have misunderstood some wording (which means that you need to make it clear) or I might have perceived things correctly (which means you need to change the structure and scope of the manuscript). One example, is sediment concentration. How can you validate flow sediment concentration from the deposit? Only if you look at grain-size curve, spatial distribution and packing (inner architectural arrangement) of the deposit. You never mention this along the manuscript which means that I am puzzled how you reconstruct sediment concentration on the inverse model. It is easy to understand how you do it with the forward model but departing from sediments (without mentioning the characteristics above) is baffling.

*RE: Thank you for your feedback. Regarding sediment concentration, we did not intend to validate the sediment concentration as it is almost impossible to evaluate the reconstructed values of sediment concentration because there are no available observational data. We only reconstructed the values of sediment concentration using DNN inverse model. However, Goto et al. (2014) used the entire thickness and measured inundation depth to estimate the sediment concentration which was around 2% in the inundation flow of the 2011 Tohoku-oki tsunami. Hence, we will add this reference and clarify the details of sediment concentration at the discussion section in the revised manuscript.*

*We have provided the explanation of all comments in reply of annotated document.*