Dear Referee #1

Thank you for your thoughtful review of our manuscript. We have carefully reviewed your comments and have revised the manuscript accordingly. Please see below our responses to each one of your comments.

The first question is on the results by ML algorithms. One of the main contributions of this paper is the equation (14), but the physical implication behind it is unclear. As authors understand, complicated equations driven by the ML algorithms will give well-fitting results. At the same time, the equations are meaningful if they are physically interpretable. There are three terms in eq. (14), and the last term reversely relates the setup height (M) with the grain size (D50). In line 297-298, authors mentioned "This second order effect could tentatively be related to beach permeability, which increases with sediment size and results in a lower setup." However, to my knowledge, the permeability is related to the distribution of the grain size, not the average of the grain size.

We agree that the distribution of the grain size is important for the permeability, but we need to point out that the median grain size is a first-order effect. Previous works such as Krumbein and Monk (1942), Ward (1964), Beard & Weyl (1973) and Sheperd (1989) presented the permeability expressed as a function of median grain size (D_{50}). Overall, the results of these studies showed that permeability increases with increasing average particle diameter size. We used this concept, as well as the results presented by Poate et al. (2016), in a tentative way to explain the physical meaning of D_{50} in our equation. However, please note that we do not claim that the presence of D_{50} in Eq. (14) is, in fact, related to beach permeability, as we do not have how to prove it with this work. Instead, we wanted to raise the discussion of the permeability role in the wave setup again, as previously mentioned by Nielsen (1988, 1989).

The second one is on the sample size and data availability. The sample size of 491 cases is relatively small to apply ML algorithms.

The ideal sample size for machine learning is a tricky issue. To our knowledge, there is no unique, optimal approach to discovering the ideal sample size; it mainly depends on the complexity of the problem, the distribution of the variables in the data available and the chosen algorithm (genetic programming). In our case, we considered all data with the same acquisition/processing procedure that is freely available. Nevertheless, we looked at previous works using genetic programming to check if a similar amount of data has been used before. Some examples of successful applications using limited datasets include Tinoco et al. (2015), Passarella et al. (2018) and Wang et al. (2021). One point we make in the conclusion is that as more data becomes available, there will be an opportunity to further improve the predictive algorithm (e.g., to reduce the scatter).

And it seems that more data are available from the provided link (https://coastalhub.science/data). It would be better to mention the reasons to use Stockdon and Holman 2011 data only.

Indeed, one extra wave setup dataset was available, the one from Gomes da Silva et al. (2018). Through personal communication with the lead author (Gomes da Silva), she indicated that the wave setup data is not reliable (we have already removed this dataset from the https://coastalhub.science/data website). That is why we decided to use Stockdon and Holman's (2011) data only.

Moreover, I could not find the grain size (D50) from Stockdon and Holman, 2011 (https://pubs.usgs.gov/ds/602/) or (https://coastalhub.science/data). Authors need to provide a complete data set, and how they acquired the grain size.

The median grain size data can be found in the 9th column of the wave runup data file at https://coastalhub.science/data. However, these values were obtained from reports and papers describing the beaches: Duck82 – Mason et al (1984); Uswash - Holland et al. (1995); Delilah – Thornton and Humiston (1996) and http://frf.usace.army.mil/delilah/start; San Onofre - Raubenheimer and Guza (1996); Gleneden – Power et al. (2019); Terschelling - Ruessink et al. (1998); Duck 94 – Stauble and Cialone (1996) and Gallagher et al. (1998); Agate - Ruggiero et al. (2004) and; SandyDuck - www.frf.usace.army.mil/SandyDuck/SandyDuck, rather than from Stockdon and Holman (2011) as mentioned. This is now corrected in the new version of the manuscript.

Minor comments

We thank the Reviewer #1 for the careful reading. The minor comments have been corrected in the updated version of the paper.

Once again, we thank the reviewer very much for the time and careful consideration of our study. These have greatly improved the quality of our manuscript.

Kind regards,
The Authors.

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