

## **nhess-2022-208: Optimal probabilistic placement of facilities using a surrogate model for 3D tsunami simulations**

The manuscript presents a surrogate-based approach for probabilistic assessment and investigation of the optimal placement of facilities under tsunami forces. The topic is interesting and the manuscript is generally well written, and the presented approach could be used as an efficient alternative for probabilistic risk assessment of coastal infrastructure assets. Therefore, the manuscript is valuable to be published after some revisions.

1. In the numerical simulation of the tsunami, results obtained from the 2D analysis are used as the input of the 3D analysis. Please clarify the validity of this simplification and show some comparison results (if any) with theoretical results or experiments.
2. When calculating the tsunami force, what was the exact mesh sensitivity in the full-scale analyses? Did the authors conduct the mesh sensitivity to ensure that the mesh sensitivity is the same for the whole range of the investigated random parameters?
3. According to the results shown in Figure 12, most of the prediction errors are larger than 10%, indicating that the samples may not sufficiently large enough for the surrogate model to be generalized well. How to determine the appropriate number of samples is an important ingredient in data-driven approaches. I suggest the author should define (or add as the future research work) an appropriate stopping criterion to determine whether the sample size is sufficient or not, or resort to the so-called adaptive surrogate modelling to reach a balanced performance by sequentially adding new samples to the training set.
4. The manuscript is well written, yet the language should be double-checked to make it more readable, e.g., “Although different placements were obtained, the risk for both parallel and series systems as shown in Table 3” on Page 21.