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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Probabilistic tsunami inundation assessment of Kuroshio Town,Kochi Prefecture, Japan considering the Nankai-Tonankai megathrust rupture scenarios" *by* Katsuichiro Goda et al.

Anonymous Referee #4

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General Comments:

The NHESS manuscript "Probabilistic tsunami inundation assessment of Kuroshio Town, Kochi Prefecture, Japan considering the Nankai-Tonankai megathrust rupture scenarios" by Goda et al. presents an uncertainty analysis of tsunami height and inundation for the southwest coast of Shikoku Island, Japan. The focus of the analysis are the sources established be the Central Disaster Management Council (CDMC) and site-specific inundation using high resolution numerical grids. The objective of the study is very well stated on Lines 47-52. The authors present a thorough uncertainty

analysis of through the use of a stochastic slip model. The manuscript is well written and logically organized. After points of clarification described below are considered, the revised manuscript should be an excellent contribution to NHESS.

Specific Comments:

The main comment that I have with regard to the manuscript is with regard terminology that would be confusing to most readers. "Probability" is used in the manuscript to describe tsunami inundation hazard assessment. This can be easily confused with probabilistic tsunami hazard analysis (PTHA), which is a very different method than what is performed in this study (see Grezio et al., 2017 for details). PTHA is an aggregation of tsunami rates and heights from different sources, including uncertainty (i.e., aggregate aleatory uncertainty is integrated into the rate calculations). Probability in PTHA is also given in terms of a particular exposure period. Neither of these aspects are considered in this study. I strongly recommend that this type of study be termed as "uncertainty analysis" or "uncertainty quantification".

Probability is also used to describe the scaling relationships. These are better termed as empirical or statistically derived scaling relationships. They are only probabilistic in the sense that the residuals are distributed according to some probability distribution. For example, standard linear regression assumes that the residuals are normally distributed, but this type of regression is rarely if ever called probabilistic. The same would hold if the residuals were distributed as a lognormal, Poisson, etc. distribution.

It would be helpful for the authors to clarify the names of the study areas, especially for those unfamiliar with geography in Japan. In the title, Kuroshio Town is referred to. In Figure 4, does Kuroshio Town encompass the Ogata and Saga districts? It would be helpful if the boundaries of these districts, Kuroshio Town, and Kochi Prefecture were included in Figure 4.

The scatter plots (Section 4.2) exhibit very weak correlation, likely because the effects of Green's Law have not been considered. Some discussion as to this effect would

be helpful. Also, results of the regression F-test would be helpful in these cases to determine whether dependence on a particular parameter is statistically significant.

Technical Corrections:

L30, 32: Please provide references for magnitudes of historical earthquakes. L35: "...which occurred on a megathrust that was originally thought to only rupture in smaller segments..." L114: The slip models shown in Fig. 2 do not look like they are derived from a circular crack model. Is this a surface-rupturing crack? Some clarification is needed. It would also be helpful to compare CDMC models with those using the authors' stochastic slip model. L138: fault -> rupture L144: Not sure what "synthesis" means here. L158: "mu" is not typeset in equation. Section 3.2: Please indicate how displacements are calculated for surface rupturing earthquakes, compared to imbedded earthquakes. L244: How does this filter compare to Kajiura's 1/cosh(kh) filter? Figure 8: Indicate that these are probability density histograms (correct?).

Reference

Grezio A., Babeyko A.Y., Baptista A.M., Behrens J., Costa A., Davies G., Geist E.L., Glimsdal S., González F.I., Griffin J., Harbitz C.B., LeVeque R.J., Lorito S., Løvholt F., Omira R., Mueller C.S., Paris R., Parsons T., Polet J., Power W., Selva J., Sørensen M.B., Thio H.K. (2017), Probabilistic Tsunami Hazard Analysis (PTHA): Multiple sources and global applications, Reviews of Geophysics, 55, 1158-1198. doi: 10.1002/2017RG000579.

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