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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.

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Goda et al. propose an extensive probabilistic tsunami hazard assessment analysis of Kuroshio Town, Kochi prefecture, for Nankai-Tonankai megathrust events, based on 1000 scenario earthquakes, able to efficiently complement the deterministic tsunami scenarios of the Central Disaster Management Council. The earthquake scenarios are stochastically-generated based on state-of-the-art scaling laws and methods, which should ensure realistic earthquake models. In particular, asperities are randomly added, contrary to the CDMC scenarios, where asperity locations are decided by ex-

pert judgment. This allows better accounting for the variability in earthquake sources, and therefore in tsunami/inundation patterns. Tsunami and inundation modeling is brought to a high degree of realism, by incorporating high-resolution topography and bathymetry data, as well as coastal/riverside linear structures and spatially-varying bottom friction parameters, depending on land-use data. The results of the study itself offer an improved characterization of the regional and local tsunami and inundation hazard, especially in terms of uncertainties, but also showcase methods to best conduct such probabilistic tsunami hazard assessment in other regions. Therefore, I strongly encourage its publication.

I nevertheless provide a few suggestions for improving the manuscript, below.

1) In this study, the results of the 2x500 scenarios are mostly analyzed in terms of 10/50/90 percentiles. One could argue that many interesting aspects of the scenarios remain unexploited and that such an approach is suboptimal for quantifying the hazard variability. For instance, families of scenarios, characterized by similar patterns might be identified by analyzing the results, using e.g. using a clustering algorithm. E.g. in fig5a, we can see that some waves start with a trough while others with a crest. It is likely that similar features might be identified and linked to specific earthquake characteristics or inundation patterns. Could you comment on this idea?

2) The probabilistic approach generates many more earthquake scenarios than a deterministic approach, but some scenarios may look unrealistic. E.g. scenario of Figure 13b, showing 2 distant asperities hardly connected, and linked by an extended zone of limited fault slip. Do you think that such a scenario may be representative of a megathrust earthquake and how to ensure that all scenario earthquakes are realistic?

3) The earthquake displacements are calculated based on the Okada approximation. Accurate 3D tomographic models exist for Japan, which could be combined with advanced modeling technics. I would expect the computed displacement field to be significantly affected by the accounting of a more realistic 3D Earth structure. Could you

comment on this limitation?

4) Minor comments

- Many plots use a rainbow color map, which is characterized by many known flaws. See e.g. http://www.fabiocrameri.ch/endrainbow.php You could use perceptually uniform colormap, which would prevent misled interpretation of your data.

- Some of your figures present large areas of saturated color (e.g. fig 13l). I think it would be wise to avoid that. (or at least write the maximum value in a corner of the figure).

- L80: 'A megathrust subduction event occurs when the accumulated slips are released forcefully and triggers intense ground shaking and a massive tsunami.' I'm not certain that every megathrust event releases a massive tsunami.

- L158: the mu character appears as a square.

- L200: Could you comment on the choice made for the assumed rupture velocities and rise time (e.g. by adding proper references?).

- L317: The definition of the slip ratio is not very clear. Is it ponderated by the area times the average slip on each segment?

- L320: ET is wrongly formatted.

- L373: 'Out of all 1,000 scenarios, there are 5 cases and 1 case where the maximum inundation depths at the vertical evacuation towers in the Ogata and Saga districts exceed the critical water depths. The chances of such exceedance are low, and these scenarios can be regarded as very extreme. ' I agree that 6 scenarios out of 1000, is not much. But it is worth noticing that the likelihood of each scenario is unknown. Please comment if necessary.

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