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Natural Hazards and Earth System Sciences
Discussions

# *Interactive comment on* "Stand-Alone Tsunami Alarm Equipment" *by* Akio Katsumata et al.

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Dear Referee #1

I thank Referee #1 for giving more comments.

- My opinion is that the empirical relations used to estimate tsunami magnitude and earthquake magnitude from peak ground displacement, provide an approximation to estimating these quantities but have not been fully adopted by the scientific community as reliable ways of assessing these magnitudes.

An empirical method is not always less accurate than theoretical methods such in the complex geophysical systems. Accuracy can be check as the input and output relationship with real data in an empirical method. So empirical methods should not be the reason of poor reliability.

-Moreover, estimates of the tsunami magnitude generated by the formula presented



which relies on tide gauge data can be significantly off.

It is true that the tide gauge data don't reflect sea surface height sometims, especially for short period waves. However it is not so often, and tide gauge responses were check when the problems were recognized. And it is well known that tsunami height measured by tide gauge are different from runups. Even so, tsunami height itself is related to potential of tsunami hazard. So I don't this there is essential problems in using tide gauge data.

-Based on this, the authors should be aware of the potential for false alarms or failure to alert of a real damaging event in a specific location due to local effects. I would strongly advise for further testing and investigation before a system like this is developed and put into operations.

-The potential for conflict with official warnings is an issue to which the authors have not provided a satisfactory response. The fact that official warnings will take precedence over those generated automatically by these systems does not prevent the potential for these systems to cause confusion amongst coastal residents in the case of conflicting assessment of the situation. This, however, is not a scientific issue but rather an emergency management one. I do not think the issue I raised, of slow-rupture earthquakes and the potential for this system to assist in such situations, has been addressed in the modifications to the methodology.

False alarm is usually due to large seismic amplitude by relatively small event. It is unavoidable in single-station method. Failure of alart is possible because the threshold is set at relatively high level of tsunami here. We are aware of the local effect. Even considering those things, we think that it is not necessary to deny supplementary way of showing the tsunami risk. Of cause the first priority should placed on official tsunami alarm. Even placing the priority on the official one, I can not deny the conflict and confusion. However any kind of things could happen at the time of huge earthquakes. There is a possibility that official alert is not sufficient for people to motivate evacuation

(due to system problems, psychological situations, and others).

By the way, we don't have any plan to manufacture such device. We just want to present the idea of such a way.

-I do not think the issue I raised, of slow-rupture earthquakes and the potential for this system to assist in such situations, has been addressed in the modifications to the methodology.

It ideal for a single-site method to become a countermeasure of slow-rupture events. Since the integral of displacement is roughly proportional to seismic moment, it would be possible to detect the occurrence of slow-rupture event by single-site processing. However the frequency of ordinary events is far more than that of the slow-rupture events, and the sensibility the MEMS sensor is insufficient for that purpose as described in the revised "Method". I think that countermeasure against slow events should be discussed as "the official alert", and I would like to leave "the device" mainly for ordinary seismic tsunamis.

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