Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-124-AC3, 2019

Natural Hazards and Earth System Sciences
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EGU
Discussions

Interactive comment on "Reciprocal Green's Functions and the Quick Forecast of Submarine Landslide Tsunami" *by* Guan-Yu Chen et al.

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Received and published: 9 September 2019

We thank the referee for providing comments. A simple idealized model with a rigid slide body is adopted because it can provide the first order estimate of tsunami wave magnitude, and the deformation of the slide does not significantly change the generated tsunami (Grilli et al., 2015). A new section (section 5.2), a new table (Table 2) and a new Figure (Figure 4) have been added in the manuscript to discuss the dispersion effect of an SMF tsunami. In this manuscript we want to propose a quick and economic method for the forecast of SMF tsunamis; the detailed waveform change due to weak dispersion is beyond the scope of the present study. In comparing the nondispersive SWE simulation of the present study and previous dispersive simulations of Li et al. (2015), the resulting maximum sea surface elevations are quite similar. Thus, using

SWEs in an SMF tsunami is justified.

The new section (section 5.2), the new table and the new Figure added are as follows:

An SMF usually has a smaller horizontal length scale than the rupture length scale of a tsunamigenic earthquake. Thus, the wavelength of an SMF tsunami is not as long as a seismic tsunami. Hence, dispersion may play an important role in an SMF tsunami and its effect on an SMF tsunami should be discussed.

Although an SMF tsunami is shorter than a seismic tsunami, the dispersion is not significant because the generated wave also has long wave lengths. Take the Case 3 of this study as an example which corresponds to a historical tsunami to the southwest of Taiwan in 1781. The sea surface waveform generated when the SMF ends is shown in Fig. 4, where the distance between the crest and trough of the tsunami wave is approximately 6 km and hence the wavelength (12 km) is much larger than the 1.1 km water depth at the SMF site. Since an SMF is usually not far from the shoreline, the wave deformation due to dispersion is limited during its propagation to the coast.

As SMF parameters used in the Case 3 of this study are taken from Li et al. (2015), dispersion effects in this SMF tsunami can be discussed by comparing with the simulation results of this previous study, where the Nonhydrostatic Wave Model (NHWAVE; Ma et al., 2012) is used to simulate the tsunami generation process and the Fully Nonlinear Boussinesq Wave Model with TVD solver (FUNWAVE-TVD; Shi et al., 2012) is used to simulate wave propagation. As hydrostatic assumption was not applied in Li et al. (2015), the dispersion effect can be properly represented. Thus, comparing the results with the nondispersive simulation of the present study can be used to quantify the role of dispersion effect in an SMF tsunami.

Li et al. (2015) provided the distribution of the distribution of maximum sea surface elevation and hence this value will be used in the following. As is shown in Table 2, the maximum sea surface elevation calculated by SWEs is close to the result of the NHWAVE/FUNWAVE-TVD dual modelling approach of Li et al. (2015). Dispersion does not significantly affect the distribution of the highest sea surface.

In Li et al. (2015), only simulated maximum sea surface elevation is shown. However, in previous studies such as Kilinc et al. (2009) more detailed results have been given and hence a more comprehensive comparison on waveform and wave height can be executed. Similar to Table 2, the waveform simulated in a dispersive model is also very similar to the result of a nondispersive model. Thus, based on these SMF tsunamis discussed above, it can be concluded that dispersion effect does not significantly change an SMF tsunami. Thus, an SWF tsunami can be simulated by nondispersive SWEs.

It should be noted that the purpose of this manuscript is to forecast an SMF tsunami. The dispersion tends to spread different wave components of the tsunami wave; thus, the predicted tsunami waveform may not be very accurate. However, as the information on an SMF is usually very limited, it is not possible to simulate or forecast the tsunami in every detail. Compared to the uncertainty of SMFs, waveform discrepancies due to a dispersion effect are minor and negligible, as has been demonstrated in this discussion. Thus, maximum sea surface elevation can be forecast by SWEs and a simple SMF model generated with satisfactory accuracy. As the purpose of this manuscript is to provide a forecast for an SMF tsunami, SWEs used in the present study are appropriate choices.

Fig. 1 below is the Table 2 of the revised manuscript: Maximum sea surface elevations of five cities/towns along the southwest coast of Taiwan for the direct SWE simulation in Case 3 and the simulation of Li et al. (2015).

Fig. 2 below is the Fig. 4 of the revised manuscript: Sea surface waveform when the SMF of Case 3 ends. The upper panel is the top view, while the lower panel is the cross-section along the black dashed line.

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Table 2. Maximum sea surface elevations of five cities/towns with locations indicated in Fig. 1(b) along the southwest coast of Taiwan for the direct SWE simulation in Case 3 and the simulation of Li et al. (2015).

Location	Longitude	Latitude	Max. Ele. in Case 3 (m)	Max. Ele. in Li et al. (2015)
AP	120.145	22.96	3.5	3.5
KH	120.26	22.625	5.6	5.4
KP	120.43	22.46	8.5	8.4
FS	120.665	22.215	12.1	13.5
NW	120.8	21.935	10.5	11

Fig. 1.

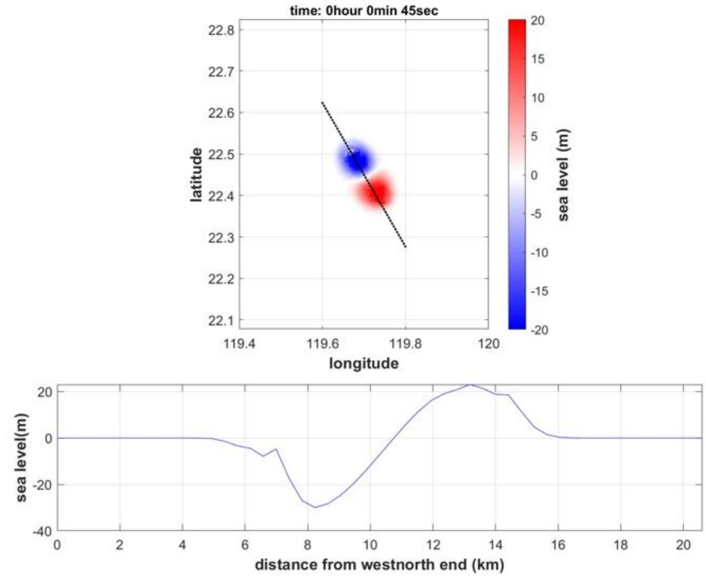

Figure 4. Sea surface waveform when the SMF of Case 3 ends. The upper panel is the top view, while the lower panel is the cross-section along the black dashed line.

Fig. 2.