Nat. Hazards Earth Syst. Sci. Discuss., 3, C1935–C1938, 2015
www.nat-hazards-earth-syst-sci-discuss.net/3/C1935/2015/

Natural Hazards and Earth System Sciences
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Discussions

Interactive comment on "Transport and bottom accumulation of fine river sediments under typhoon conditions and associated submarine landslides: case study of the Peinan River, Taiwan" *by* A. A. Osadchiev et al.

Anonymous Referee #1

Received and published: 7 October 2015

This manuscript presents a modeling study of the coastal ocean sedimentation process associated with the mountain river runoff under normal and extreme discharge conditions. Mountain rivers have a "flashy" flow regime and their discharge can sharply increase under the heavy rain conditions (the situation explored by the authors). Another characteristic of mountain rivers is that they carry a very heavy sediment load. When those sediments are accumulated on the narrow, sloping shelf they become susceptible to submarine landslides and as such represent a significant natural hazard (e.g., possibility for the tsunami wave generation). Although this work is a case study

of the Peinan River on the southeastern coast of Taiwan, the results might be applicable to several other regions of the World Ocean, most notably the northeastern Pacific (Gulf of Alaska), the Pacific coast of South America, and the coast of Japan.

This topic should be of significant interest for a broad, interdisciplinary audience of researchers and certainly for the NHESS readership. However, the quality of this study needs to be improved. My review is focused primarily on hydrodynamics (area of my expertise) but I do have one comment about the sediment transport component in this study. Only small particles (less than 10-4 m) are considered and I assume that the same particle size is specified under the normal and typhoon conditions. Why is it so? Won't the typhoon forcing lead to the presence of coarser sediments, not only to the increased sediment concentration? In terms of a coastal hazard, the intermittent layers of coarse and finer sediments represent a much greater danger for the submarine landslide.

I have several questions and comments about the hydrodynamics.

1. In Section 2, the authors describe in details the Kuroshio Current and argue (rightly so) that it strongly affects coastal circulation in the study area and the Peinan river plume in particular. However, when it comes to model formulation, I don't see the Kuroshio Current to be represented in any form at the model open boundaries: only barotropic tides are mentioned on page 5166. What is the point of discussing the Kuroshio Current then?

2. I am not convinced that the typhoon Marakot forcing conditions are correctly represented in this study: the inset in Figure 5e shows that the discharge rises and falls at the same temporal rate. This is not correct; even for mountain rivers the peaking discharge subsides to its normal level at a slower rate than it rises. The temporal evolution of the freshwater discharge should be asymmetric: faster increase and slower decrease. The authors should present observational data if they insist that they correctly represent the freshwater discharge evolution during the typhoon passage.

3. Model validation is entirely inadequate. So little information and details are given in section 5 and the corresponding Figure 4, that this part can be dropped altogether without any reduction of the paper quality. But it would be much better if the authors provided sufficient information. The surface salinity is much lower in the model than in observations on April 16 (look at the 30 isohaline). What about the vertical structure? It seems to me that the model fails to reproduce the observed level of vertical mixing in the plume. The observed and modelled plumes are quite different on 17 April too, except for the fact that they are both affected by the upwelling favorable wind (being shifted northward from the mouth). Most importantly, there is no validation for the sediment transport and deposition, the primary focus of this study.

I noticed a number of minor errors, ambiguous statements and other technical issues.

1. The quality of figures needs to be improved. All geographic objects mentioned in the text should be shown on the map or in other figures; this is a common standard. For instance, Green Island, Taitung Canyon, meteorological station in the Fugang Fishery Harbor, the location of freshwater discharge measurements and the tide gauge station CG all need to be marked either in figure 1 or 3. The quality of Figure 2 is poor, it's hard to see anything there, in particular those two canyons mentioned on line 10, page 5162.

2. "The alongshore propagation ... were about 16 and 3 km..." (line 12, p. 5163). Perhaps, the alongshore extension? What do the authors mean by "plume dissipation" (line 21, p. 5163)? Perhaps plume dispersal? What is "one nautical minute" (line 17, p.5164)? Perhaps, nautical mile (or simply "minute")?

3. The Mellor-Yamada turbulence closure scheme (line 25, p. 5164). Which level?

4. Mean velocities in eq. (1) and vertically averaged velocities in eq. (5): are they the same? If so, use the same terminology and notation (overbar), if not, then what does the "mean velocity" in eq. 1 mean?

5. The Peinan plume cannot show any synoptic variability (it's too small for that) (line 11, p.5171). Perhaps it's mesoscale or even submesoscale variability?

6. "Under moderate discharge conditions wind forcing and Coriolis force determine the alongshore spread of the Peinan plume". I am not sure what it means or whether it is correct. Alongshore velocity in the surface trapped plume is scaled as sqrt(g'*d) where g' is the reduced gravity and d is the plume thickness (this scale holds even for the geostrophic cross-shore balance). So it is the density anomaly! And of course mixing will reduce the density anomaly and ultimately the downstream propagation. As far as mixing goes, both wind stress and tidal mixing should be taken into consideration.

7. The authors should define quantities and their units shown in Fig. 7 (left panel). How is "relative possibility of formation of submarine landslides" defined?

8. Overall, the manuscript will benefit from proof reading by a native English speaker.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 5155, 2015.