

Interactive comment on “Turning the tide: comparison of tidal flow by periodic sealevel fluctuation and by periodic bed tilting in the Metronome tidal facility” by Maarten G. Kleinhans et al.

Anonymous Referee #2

Received and published: 9 May 2017

This manuscript addresses a new type of the experimental facility for morphodynamics of tidal currents. The Metronome is an experimental flume to enable physical simulation of sediment transport processes by long-period oscillatory flows such as tidal currents. Judging from this preliminary report, the experimental technique employed in the Metronome can be evaluated with promising results. Thus, the topic addressed is interesting and deserves a constructive discussion in Earth Surface Dynamics Discussions. However, there are several issues to be clarified for publication.

Main issues are:

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(1) The importance of the spatially non-uniform flows in developing estuarine geomorphology should be discussed in the paper. As the authors pointed out in Figure 1, one of the essential differences between the periodic tilting flume (Metronome) and natural estuaries is the spatial heterogeneity of flow discharges. In natural estuaries, flow height and velocity vary remarkably in space, whereas the Metronome produces quasi-uniform unsteady flows. Although this difference could be negligible for morphodynamic processes in estuaries, this should be discussed in detail at the discussion chapter.

(2) The purpose of comparison between experimental results and model calculation is unclear. To prove that setting of the facility is appropriate for experiments of estuaries, the experimental results should be compared with observation of natural estuaries or numerical simulations using conditions of the natural environments. However, the model calculation in this paper was conducted at the initial and boundary conditions similar to the experimental flume. Thus, the comparison can be validation of the model, not the experimental flume. It could be better to conduct numerical experiments with strongly non-uniform flow conditions, and to compare results with those of the periodic tilting flume.

(3) The descriptions of results often contain interpretation or speculative comments (ex. P.10 lines 1-8; P.11 lines 30-33; P.13 lines 15-19). These comments should be moved to the discussion chapter.

Minor comments:

(1) Definition of the parameter Q is missing (probably flow discharge $Q = uwh$). In addition, the advection seems necessary in equation (2).

(2) Figure 12c shows that the model prediction of water level in the sand-bed channel experiments is very different from the measurements even from the qualitative viewpoints, but this figure is not cited and be addressed in the text.

C2

