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Earth Surface Dynamics Discussions

Interactive comment on "Multiple knickpoints in an alluvial river generated by a single instantaneous drop in base level: experimental investigation" *by* A. Cantelli and T. Muto

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Dear Prof. W Kim, I really appreciate your comments and here my "answers":

After some serious time trying to give a constructive reply to your valuable comments I am reaching the follow conclusions: I tried the suggested analysis with no substantial results. Reasons: 1) poor accuracy in the flow data acquired, the resolution on depth is at pixel scale and +/- one pixel represent 20-30% error; 2) we have very high percent of sediment concentration during the knickpoint erosion and as result all the theory on sediment transport is not applicable with meaningful results; 3) in all this, cohesiveness of the deposit play a key role and we have no data on this.

Therefore, in order to answer in detail these questions we need data on flow fiels, sediment concentration and quantify cohesiveness.

Said that, I observed the phenomenon and I "know" all is related to the maximum sediment transport capacity of the flow and the cohesiveness due to the capillary forces. I will try to explain my observations and expand the discussion as rightly suggested.

The system needs multiple knickpoints to reach the new equilibrium state because one single knickpoint does not remove all the material. More distant we are from the equilibrium with a single passage of knickpoint, more luckily we are able to get another knick point. In case, however, we increase the initial drop in level above a certain value the knickpoint does not get generated anymore but we obtain a concave profile that hardly tends to the equilibrium configuration. Why this is happening, I could not figure out and it would be probably object of future investigation.

In summary, I believe that the set of experiments proposed here highlights the possibility to have multiple knickpoints related to a single drop in level but unfortunately (and honestly) are not enough to fully explain all the variable and even more define the problem from the fluid mechanics point of view. It is in fact obvious that the dimension of the flume and the forces in place are tremendously scaled down and this was an obstacle in the velocity field acquisition. I am convinced that we need to explain more the process; however I would not be able to provide the requested details using this set of experiments.

We will include this experimental observations and "limitations" in the paper. Best Regards Alessandro Cantelli

Interactive comment on Earth Surf. Dynam. Discuss., 1, 483, 2013.