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Earth Surface Dynamics Discussions

Interactive comment on "Development of a meandering channel caused by the plane shape of the river bank" *by* T. Nagata et al.

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This paper presents a spectacular case with a scientific importance that cannot be overrated: a weakly meandering river that climbed out of its harnass in a big flood and did more meandering. Absolutely fantastic from a scientific point of view (and I realise and respect that the damage to the country must have been significant and hopefully no lives were lost).

The written paper however does not do the scientific contents enough credit. I have 3 main commments:

0. A more extensive review on dynamics of meanders is needed. This can be used to present some concepts and theories relevant to the case, for example the stability

analysis of bars now presented in fig 15 and the definition of meanders in fig 7. Perhaps also more info on recent modelling and experimentation.

1. Describe the field observations in more detail and then discuss on the basis of these theories what you think happened. A reference to a Japanese journal for further description is scientifically correct but in practice not of much use because most readers like me cannot access that paper. If presentation of more observations would then amount to repetition (possibly seen as self-plagiarism by silly software) then I propose that the authors do present that material in an online supplement. To me it seems that the very large flood reformed the river with longer meanders, which are partly forced by bank protection structures and initial morphology. That one big meander that cuts deep into the bank just downstream of the bank protection is a very nice example of how the bend information propagates downstream as predicted in Lanzoni & Seminara and experimentally demonstrated by my group in the cited work of Van Dijk et al.

2. The model needs more explanation. Clearly there is no floodplain formation in it so it is highly likely that the model would, given enough time, develop towards braiding. Has this test been done? Or does the model become unstable after a longer time? Or is the meandering maintained because the upstream supply of sediment is smaller than the transport capacity of the river? (Or was the upstream boundary forced to equilibrium so that the feed matched the capacity exactly?) Also it is now known that the transverse bed slope effect is incredibly important for the bar mode and for the channel depth and bar height (Schuurman et al. in press in JGR). Has the sensitivity of the present model been tested for this or do the authors assume the value of alpha*sqrt(Nondimensional shear stress) from Ikeda?

The paper would benefit from an improvement of the structure. Although it is about right on the outside, the strange order of the figures indicates that it is still a bit messy. I find a useful check method for my own work that the figures should be ordered and described from concepts to field results to modelling and to discussion/conclusions and referred to in that order.

Interactive comment on Earth Surf. Dynam. Discuss., 1, 1019, 2013.