Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Uniform flow formulas for irregular sections" *by* E. Spada et al.

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This paper presents two new formulas to compute uniform flow discharge in cross-sections that can be divided in several sub-sections. The main aim is to take into account the interactions between adjacent sub-sections.

I think that this paper is out of the scope of HESS because it is a pure hydraulics / fluid mechanics paper. Perhaps a use-case doing a link with another domain in Earth sciences would make this paper more interesting for HESS readers and closer to the scope of this journal. For example is it a bad idea to use one of your new formulas to disaggregate the mean velocity in the main channel computed by a 1D shallow water solver using the standard Manning-Strickler formula, to evaluate local vertically averaged velocities in sub-sections and then compute bottom shear stresses? Doing that could be useful to improve 1D sediment transport computational programs. Do

you agree?

Anyway my questions and remarks follow:

1/ When they are used in 1D shallow water simulations, the purpose of this kind of head loss formulas is to take into account the lateral variation of the roughness / flow resistance, that is, in fact, the Manning coefficient. In the paper only a constant Manning coefficient is considered. Even when the formulas are validated against a real case, the Manning coefficient is taken constant along a river reach 13 km long. I am pretty sure that it is possible to obtain the same agreement with standard calibration of Manning-Strickler formula and a Manning coefficient different in several sub-reaches.

2/ It would have been interesting to compare the formulas against a standard 2D shallow water simulation, in both cases laboratory flume and real river.

3/ equation 1: if I understand the paragraph following this equation well, the energy slope is assumed to be identical in each sub-section, so the subscript for S_f is erroneous.

4/ page 2618, line 10: "If β is close to zero, ...". This point is not clear for me; LRHM appears, at this point, like a continuous formula when DCM is a discrete formula.

5/ page 2619, last line: the numbering scheme of the validations look like a typo.

6/ page 2620, §3.4: How is Δq computed?

7/ page 2622, point 2 (lines 4-5): this (widely used) statement needs a discussion. It is surprising that it is said that the Manning coefficient is varying with the water depth, and not that it is the exponent in the relationship expressing Chezy coefficient in terms of Manning coefficient and hydraulic radius, or that the whole relationship should be revisited. Why the Manning coefficient and not the other terms of the formula?

8/ page 2623, lines 21-22: it seems that there is a missing word (verb) in this statement.

9/ page 2627, lines 8-10: that does not prove that an uniform flow has been reached.

For that, the same condition must be verified in each cross section along the reach, so that the energy slope equals the bottom slope.

10/ page 2628, point 2 line 11: I didn't see any proof that the estimation of β (to $\sim$9) is still valid for real rivers.

11/ table 5: it is strange to want a Manning coefficient which can vary with the water level but must remain constant along a river reach 13 km long. How to be sure that the roughness is constant throughout 13 km?

12/ table 6: this table does not clearly prove that IDCM, INCM and LHRM does better than DCM, the differences are too small to be convincing.

13/ Figures 5 to 10 (graphs) would be more readable if they were in colors.

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