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Hydrology and Earth System Sciences Discussions

Interactive comment on "Comment on "A dynamic rating curve approach to indirect discharge measurement" by Dottori et al. (2009)" *by* A. D. Koussis

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I think the comments by Koussis rather miss the point of the original article. He criticised Dottori, Martina, and Todini (2009) by assertion rather than by argument. He stated that their work missed practical aspects, and then "Measuring at two cross-sections is not convenient". I disagree: if measuring at one cross-section can be done, then measuring at two can be also. Then he stated: ".. the two gauges would have to be so positioned that the recorded stages give a good representation of the slope of the wave profile. This is not a trivial requirement, because depth is controlled by the local stream geometry, in contrast to the flow rate that varies in space more gradually". If one examines the surface of a river, the surface profile seems almost always to be

varying perfectly smoothly, whatever contortions the bed is undergoing. Consider the momentum equation

$$\frac{\partial Q}{\partial t} + \left(gA - \beta \frac{Q^2 B}{A^2} \right) \frac{\partial \eta}{\partial x} + 2\beta \frac{Q}{A} \frac{\partial Q}{\partial x} = \beta \frac{Q^2 B}{A^2} \tilde{S} - \frac{\lambda}{8} P \frac{Q\,|Q|}{A^2}.$$

Whereas the area A might be varying substantially, certainly the driving slope $\partial\eta/\partial x$ is usually smooth. This is the sort of practical detail that Dottori *et al.* did not concern themselves with, but it remains a detail. It is not a substantial practical objection.

Then Koussis said: "That gauging stations will be at hand where needed is all the more doubtful, if not unlikely, as monitoring networks are shrinking worldwide and are increasingly difficult to maintain". Whereas that might be true, it is not a valid technical criticism of the Stage-Slope-Discharge method (Herschy 1995, Chapter 8; Fenton and Keller 2001, §3) that Dottori *et al.* advocate.

Following this Koussis goes into a number of detailed remarks about the use of Jones-type methods. These, however, are not what Dottori *et al.* were concerned with. The Stage-Slope-Discharge method solves the problem differently.

I also thought Koussis understanding seemed faulty and unnecessarily misrepresentational when he wrote "introducing higher-order derivatives (e.g., formulae of Fenton and Perumal 2) while incurring numerical oscillations, does not seem advisable, especially when considering the morphologic variability of 15 natural streams". The Fenton formula was an attempt to incorporate analytically the sort of diffusion that Koussis' Jones-type methods do not have, namely rational treatment of diffusion.

References

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 7429, 2009.