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Hydrology and Earth System Sciences Discussions

Interactive comment on "Discharge estimation in a backwater affected meandering river" *by* H. Hidayat et al.

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We would like to thank reviewer#1 for his/her concise summary of our contribution on discharge measurement in a backwater affected river reach and comments on our manuscript. We give hereafter answers to all specific comments:

Comment 1: Page 2670, line 4: please add the citation of the original work by Jones (1916), see in the Reference section.

Reply: The citation of the paper by Jones (1916) has been added in the revised ms.

Comment 2: Page 2670 lines 21-22: please note that the formulae presented by Dottori et al. (2009) do not rely on the steady state assumption.

Reply: We have rephrased the sentence by excluding the assumption of a steady state.

Comment 3: Page 2674, Eq. 2: The term η is represented in Fig. 2 but is not explained here.

Reply: η is water level variation as explained right after Eq. 1 (page 2673). For clarity, the definition of all terms in the figure are now added in the caption of Fig. 2.

Comment 4: Page 2678, lines 5-6: please correct as: "...c is the wave celerity, S_0 is the bed slope, and dh/dt is the rate of..."

Reply: Corrections have been carried out in the revised ms.

Comment 5: Page 2678, Eq. 10: according to the original version of the Jones formula, the discharge taken from the steady flow rating curve should be used in place of Qkin. Eq (11) is the expression of the uniform flow discharge, therefore it should be used in Eq (10) only for prismatic channels, where steady flow coincides with uniform flow. The authors should state clearly whether or not the river reach can be considered as a prismatic channel. See section 2.1.1 of the paper by Dottori et al (2009) for a more detailed review of the Jones equation.

Reply: The reviewer provided a useful consideration which we adopted in the revised ms. Indeed, the stage-discharge relation can only expected to be applicable if the the channel geometry is uniform. The top panel in Fig. 2 shows there is some irregularity in the cross-section, related to the low flow velocities beneath the jetty. Therefore, the complexity of the stage-discharge plot can be partly explained from the non-uniformity of the channel geometry, which is now mentioned.

Comment 6: Page 2680, lines 24-27: I do not agree with the sentence "The Froude number takes a value around 0.01, which legitimizes neglecting the spatial and temporal acceleration terms in the momentum equation, validating the non-inertial wave approximation". A low value of Fr does not necessarily imply a non-inertial wave condition, which depends instead on the relative magnitude of terms in the momentum equation. See secton 2.4 of the paper by Dottori et al. (2009) for a discussion about this issue.

Reply: Indeed, the occurrence of non-inertial wave conditions depends on the relative magnitude of terms in the momentum equation. A non-dimensional version of the St. Venant equations directly shows that the inertial terms drop out for small values of the Froude number. We added a reference to the work of Pearson (1989) about this issue.

Comment 7: Page 2680, line 29: The sentence "there is no theoretical justification for this" related to the kinematic wave assumption is too strict. The kinematic wave approximation can be used in certain conditions of flow and bed slope as stated by Perumal et al. (2004) and Dottori et al. (2009).

Reply: The sentence has been reformulated as follows: Although this approach can be successful under certain bed slope and flow conditions (Pearson, 1989, Perumal et al., 2004, Dottori et al., 2009), the kinematic wave equation cannot capture discharge dynamics in backwater affected river reachs (e.g. Tsai, 2005).

Comment 8: Page 2690, Figure 4: these plots are not very clear, please replace them with either standard line plots or histograms.

Reply: We changed Figure 4 using line plots.

Pearson, C. P.: One-dimensional flow over a plane: Criteria for kinematic wave modelling, J. Hydrol., 111: 39 48, 1989.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2667, 2011.