Hydrol. Earth Syst. Sci. Discuss., 7, C4918–C4921, 2011
www.hydrol-earth-syst-sci-discuss.net/7/C4918/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimating river discharge from earth observation measurement of river surface hydraulic variables" *by* J. Negrel et al.

J. Negrel et al.

jean.negrel@teledetection.fr

Received and published: 31 January 2011

Dear reviewer,

First of all, we would like to thank you for the time you spent reading and commenting our paper. You provide really good comments which will help us a lot in improving the new version of the paper for submission.

1. It appears we didn't express well our views of the Berklie models. We didn't intend to disparage this method. As you point it, it gives quite good results on the Manacapuru station dataset, while we didn't run recalibration for the Amazon River. This recalibra-

tion would have come against our approach of the discharge estimation with no in-situ measurements. The second concern we had about these models is the need of the river depth information for the models 1 and 4, an information impossible to reach, for now, form EO techniques. Finally, these models were not validated against global discharge to the oceans, but they present a good global mean error, that's why we pointed it.

2. Once again, we didn't mean to disparage the Bjerklie's models, we just reach the same kind results using the recommended parameters for these models. We seriously need to reformulate this part.

3. You're right, the first step of our method is the formulations of the assumptions, but it's also the simplification of the discharge equations resulting from these assumptions. Which is what we meant here, discharge formulation coming from Saint-Venant equations. The second step of our method is the research of the hydraulic parameters by solving the regression.

4. Ls and L represent, that's right, top width. We choose two different symbols to distinguish the reality from the simplification of our assumption.

5. We can't really quantify the "reasonable number of measurements". The more the better. But it appears that at least five different measurements covering at least one complete hydrological cycle is required. But more measurements covering several cycles are preferred to mean some specific events.

6. Indeed, "assumptions" seems better than "hypotheses"; we're not validating nor invalidating them.

7. "Permanent flow configuration" means that we do not have rapid modification of the discharge during the measurement of the surface data. It's a translation error, we should have written "steady flow configuration".

8. We don't find references for this assessment; it comes from observation on a large

number of measurements on the whole Amazon basin and Rhone River. As it's widely admitted we can simplify the hydraulic radius by a mean depth, we should remove this and just explain we assess the simplification of the hydraulic radius.

9. We didn't list equations (8) and (9) directly below the lines 25 on page 7844 and line 1 on page 7845, respectively, because of equations (6) and (7) which lead to equation (9). This explanation of equation (9) was not intuitive below line 1 on page 7845. If we remove this explanation, as you suggest it, it become surely better to read with this new placement of equations (8) and (9).

10. Vmoy is Vmean on page 7845, we just forget it while translating.

11. That's right, it's K3/2, thank you for this typo error.

12. We will use another symbol to define the minimization criteria, that's right, it can be confusing using the same symbol for the linear energy slope and the minimization criteria.

13. The assumptions made in the development of the 1D hydrodynamic model are described in [Baume 2005]. The model solves the Saint-Venant equations assuming we are in a steady flow configuration.

14. We don't handle the data acquisition on the Amazon River, it comes from the ANA-Hybam project, and therefore we can't know if any measurement error can induce variation of the Strickler coefficient. On the other hand, considering the variation on sediment load and the dune movement on the river bed, it seems reasonable to get variation on the Strickler coefficient. That's an interesting to question to quantify how the variation of this coefficient modifies the estimation process. As we pointed in the paper, we might have an issue with the surface slope estimation, especially at the Obidos station, which is under tidal influence.

15. The correlation between variables and discharge is surely an interesting study to make, but not only on Obidos data. The differences between Obidos and Manacapuru

data might be a clue to explain the results of the estimation model. Globally all variables are highly correlated to the discharge except the surface slope on Manacapuru station.

16. The main problem with surface slope is the lake of ground-truth data. We are quite blind with this variable, therefore it seems difficult to quantify the expected precision error and to test the sensitivity. We could propagate the expected precision error on level to the surface slope to get a clue and then study the sensitivity on this basis.

17. The amplitude is the maximum variation of the mean bottom level. The ADCP measurements give us the depth on the whole section of the river. We simply computed the mean bottom level as the difference of the mean ADCP depth and the surface level. The variations of the bottom level appear less important on Manacapuru data than in Obidos. This might be unclear compared to the bottom level, this should be compared to the mean water depth.

18. It is perfectly intuitive that Q1 match perfectly the simulated data as alpha is fixed to 0.9, like in the hydrodynamic model. But there is still one assumption applying on Q1 : the bottom level represented by the mean bottom level Zb. What we wanted to explicit here is the estimation model tries to reduce the differences between the two estimation Q1 and Q2. As consequence, even if simulated data fit exactly Q1, this equation can be modified when adjusting the parameters on Q2.

19. By computing the surface slope fitting Q2, we wanted to know what it would be compared to the simulate slope. It appears, in fact, lower than the simulated slope. As this computed slope allows a perfect fit of the equation and the estimation, we called it perfect slope. This part has to be developed and clarified. Thank you for all your interesting comments, this will improve the rewriting of our manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 7839, 2010.