

***We would like to thank Anonymous Referee # 2 for reviewing this manuscript. The following response aims to address the comments provided.***

Referee # 2: Often throughout the manuscript the reader is referred to other, previous studies -I think it'd be better if there was some more detailed explanation in this paper, so it becomes much more comprehensive (e.g. altimeter data processing, model used to simulate Q, etc)

***Reply: This manuscript was initially written to be published as a letter, which explains the short description of current studies in the same field, and the material and methods used. A more detailed description of the dataset and methods will be provided in the revised manuscript.***

Referee # 2: There is hardly any detail on which assimilation technique/scheme was used (e.g. EnKF, Variational, Particle Filter?, etc). This is, however, vital for this study.

***Reply: We called assimilation the direct replacement of simulated discharges by observations at grid cells. In order to avoid misunderstandings, this process will be renamed and the term “assimilation” will be removed from the manuscript.***

Referee # 2: How appropriate is a kinematic routing for the Amazon where most of the flow is diffuse (see Trigg et al., 2009, in JoH)?

***Reply: According to a comparison performed by Yamazaki et al. (2011) at the global scale, low differences can be noticed in discharges simulated by both kinematic and diffusive wave formulations. For example, at Obidos, in the Amazon basin, correlation values are of 0.95 and 0.97, and Nash-Sutcliffe (NS) coefficients are of 0.78 and 0.83, respectively. In another study presented by Paiva et al. (2012) using a calibrated hydrological model coupled with full hydrodynamic model (Saint-Venant equations), NS is 0.89 at Obidos. The same value was obtained by Getirana et al. (2012) at the same station using a kinematic wave method (the same simulated discharges are used in this study in Experiment 1). These results suggest that uncertainties related to (1) meteorological forcings (mainly precipitation), (2) the simulated vertical water balance and (3) observed data used in the evaluation process have a higher impact on simulated discharges than the routing method itself. In this sense, we think that the kinematic wave formulation can be appropriate to simulate discharges in the Amazon basin or any other large basin, in a global modeling framework. Anyhow, a sentence describing the limitations of using the kinematic wave assumption rather than a diffusive will be added in the Conclusions of the revised manuscript.***

Referee # 2: In eq 5 RE can be negative, so please verify equation text

***Reply: The text will be corrected in the revised manuscript.***

Referee # 2: in the case of non-convergence curve fitting, how realistic is z?

***Reply: In this case, even in situations where discharge estimates are accurate, z has no physical meaning. A sentence discussing this case will be added in the revised manuscript.***

Referee # 2: In conclusion, does this mean that without assimilation, the rating curve method does not work?

***Reply: No at all. This means that, in a case where global-scale models with default parameterizations are used, errors might occur in some regions, especially in smaller areas. As one can see in Table 1, discharge estimates derived from rating curves in Experiment 1 performed overall better than model outputs at stations with medium and large drainage areas. However, it is clear that the replacement of simulated discharges by observations will improve the overall result. In addition, previous studies (e.g. Leon et al., 2006; Getirana et al., 2009) have demonstrated the potential of the rating curve method in estimating discharge in smaller areas of the Amazon basin. A sentence addressing this point will be added in the revised manuscript.***

**References:**

***Getirana, A.C.V., Bonnet M.P., Roux E., Calmant, S., Rotunno Filho, O.C., Mansur, W.J., 2009. Hydrological monitoring of large poorly gauged basins: a new approach based on spatial altimetry and distributed rainfall-runoff model. Journal of Hydrology, 379, 205–219. doi:10.1016/j.jhydrol.2009.09.049.***

***Getirana, A.C.V. Boone, A., Yamazaki, A., Decharme, B., Papa, F., Mognard, N., 2012. The Hydrological Modeling and Analysis Platform (HyMAP): evaluation in the Amazon basin, J. Hydrometeorol., 10.1175/JHM-D-12-021.1.***

***Leon, J.G., Calmant, S., Seyler, F., Bonnet, M.P., Cauhope, M., Frappart, F., Fillizola, N., 2006. Rating curves and estimation of average depth at the upper Negro river based on satellite altimeter data and modelled discharges. Journal of Hydrology, 328 (3–4), 481–496.***

***Paiva, R.C.D., Buarque, D., Collischonn, W., Bonnet, M.P., Frappart, F., Calmant, S., Mendes, C.B., 2012. Large-scale hydrologic and hydrodynamic modelling of the Amazon River basin. Wat. Resour. Res., in review.***

***Yamazaki, D., Kanae, S., Kim, H., Oki, T., 2011. A physically-based description of floodplain inundation dynamics in a 1 global river routing model. Wat. Resour. Res., 47, W04501, doi:10.1029/2010WR009726.***