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Hydrology and Earth System Sciences Discussions

Interactive comment on "Multi-objective automatic calibration of hydrodynamic models utilizing inundation maps and gauge data" *by* N. V. Dung et al.

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The authors thank the Referee 3 for his constructive and valuable comments. The addressed comments will be replied as follows:
RC3-j means the comment number j from the Referee 3
AC3-j means the corresponding answer to RC3-j
(And some answers to general points were included in the reply to the Referee 1)

RC3-1: page 9180, section 3, line 11: How were the flood extent maps obtained? The

authors should briefly describe how the SAR images have been processed.
AC3-1:see general point 2, reply to comments of Referee 1

RC3-2: page 9180, section 3. More detail about the topography of the area should be given. For example, how large is the model domain and which is DEM horizontal resolution? But, it is not clear to me why the 1D model was chosen for this study. Estuarine areas are the perfect test case for 2D models giving their particular topography, i.e.essentially flat without a well defined river bed and river sections. Correctly, the authors refers to the original Mekong Delta Model, a quasi 2D model (channel and weirs) but here the 2D effects are modelled using a probabilistic-fuzzy approach which, in my opinion, introduces high uncertainties giving its "subjective" nature. Why not simply use the DEM to create a 2D inundation information using the water level modelled in the channel and the ïňĆood volume with a simple interpolation on the inundated cells?
AC3-2:see general point 1 and 3, reply to comments of Referee 1. The evaluation of the F2 measure is designed to consider uncertainty aspects in the inundation maps, the modeling approach and the representation of the micro-topography in the model. The DEM is the standard Shuttle radar Topography Mission (SRTM) DEM and has a horizontal resolution of 90 m. We will add this information in the data description part.

RC3-3: page 9182, line 2. Please expand "resp."
AC3-3: we will do so.

RC3-4:.page 9182, section 4. I think some considerations on the ranges of roughness parameters considered should be done. In my opinion the values within the ranges are not consistent with the physical characteristics of the area, especially for the lowest values (10-20 for Strickler which means "natural stony streams" or "dense vegetated riverbed" or "urbanized areas" (see Fabio et al, 2009). Now I'm not sure the Mekong

delta can be assimilated to a steep stony mountainous streams being essentially a flat area where water flows are quite slow. This assumptions (together with the use ofF2 OF which is biased towards large inundation extent, i.e. its value increases with larger inundation and thus may lead to unidentifiable parameter spaces) can return very low calibrated values (Table 6) which doesn't sound to me. I suggest to perform a Monte Carlo sensitivity analysis to explore the parameter space and to justify in a less subjective way the choice of roughness coefficient ranges.
AC3-4: see general point 4, reply to comments of Referee 1.
In short: we are dealing with calibration in a sense that the calibrated parameters, i.e. the roughness, has to compensate model errors. Therefore the range should be as wide as possible and the calibrated values are therefore often not in the range of expected values for the physical environment represented by the model. Only in almost error free models this can be the case.

RC3-5: Section 4.3.1. The authors should supply some details on the way the weights in the F1 have been chosen. In my opinion this choice can have a large influence on the final results of the calibrations and, probably, the "strange" values of roughness coefficient obtained can be explained by this. As above, I suggest to perform a sensitivity analysis in order to quantify the inïňĆuence of these weights on the final results.
AC3-5:The weights are given according to the importance of the stations regarding the inundation process. For example, an emphasis i put on Kompong Cham in Cambodia, where the overbank flow happens first initiating the large scale inundation. For the same reason, Tan Chau, Chau Doc and VamNao are usually considered the most important stations for inundation in the Vietnamese part of the Delta and thus given higher weight in the calibration. In the actual setting of the weights some subjectivity is involved (which is very often the case), but it is based on expert knowledge of the hydraulic regime, which is justifiable from our point of view. Also, in preliminary runs of the calibration we used uniform weights in F1, but the overall performance of the

calibration was worse compared to the weighed scheme.

RC3-6: page 9189, equation (5). As above in 5 but for F2.
AC3-6:We are dealing with flood modeling, therefore we considered only the flood season in the model. Flood extent maps prior to inundation start were not considered in the calibration (weight = 0), because these maps do not provide any useful information for assessing the ability of the model to simulate the floodplain inundation process. With no observed inundation area F2 would always evaluate to 0. Therefore we excluded them from the calibration to eliminate the disturbing impact of the overall performance in F2. In contrast to this almost all maps during the flood period were assigned with equal weights (weight = 2). The only exception to this rule is the map from October 7th. Here only a part of the inundation area is mapped, the Cambodian floodplain part is missing. We therefore reduced the weight of this particular map to half of the other flood period weights.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 9173, 2010.