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Hydrology and Earth System Sciences Discussions

Interactive comment on "Reconstructing the tropical storm Ketsana flood event in Marikina River, Philippines" *by* C. C. Abon et al.

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RESPONSES TO COMMENTS OF REFEREE # 1 TO THE PAPER "RECONSTRUCTING THE TROPICAL STORM KETSANA FLOOD EVENT IN MARIKINA RIVER, PHILIPPINES"

General comments
We thank the reviewer for reading our manuscript thoroughly and for the constructive

comments about the text. We have revised the manuscript following all receive corrections and comments:

Specific comments

> For a rainfall data input derived from a station to the southwest of the study area, the hydrologic model simulates the 26 September flood flow hydrographs for the various interview stations (Figure. 5). The match of the flood peak arrival times predicted by the model (Figure 5) to those reported for the 6 interview stations along the river (Figure 2 in the current version of the paper) might be considered to be a kind of model validation, though the authors do not make this claim as such.

RESPONSE: The interviews were conducted a day after the typhoon because we want to ask the people while the event is still fresh from their memory. Afterwards, we developed the basin model in the HEC-HMS and actually used the interview data to validate the model. The results showed that there is a lag time between the peak rainfall and runoff enough to issue early warning if only early warning system is in place. And we showed that these events can be modeled and the simulation time is fast enough that this model can be incorporated in an early warning system as a guide to warn people when the flood will be coming.

> The type of procedure outlined in the paper could well have flood hazard and flood warning applications in other regions these needs are challenged by limited available hydrological information. The study could have been improved by a program of making direct field estimates of the peak discharges achieved for the 6 stations where maximum flood heights were recorded

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from the local interviews and field surveys. While technically feasible using hydraulic software, such as HEC-2, there may have been complexities in the local field sites in regard to generating the cross-sectional data necessary for input to the models. In any case, while such new work is beyond the scope of this paper, this issue can at least be pointed out in the paper.

RESPONSE: We agree that this type of measurement should be done. However, to date, there are no gaging stations installed in those 6 stations. We however added a calculation based on the published DPWH-JICA Discharge Rating Curves (March 2002) for Marikina River at Sto. Nino Station (Station 6): Q = 17.01 $(H\text{-}0.00)^{1.85}$ for $H < 5.33$ meters Q = 0.20$(H\text{-}00)^{4.49}$ for $H > 5.33$ meters. The peak flow of 5921.6 m^3/s computed from the HEC-HMS corresponds to the gage height of H = 9.9 meters. These computations are consistent with the observed flood water levels relative to the low banks. We have also added photos showing flood marks reaching these heights.

There are also many limitations on the study that could have received more attention. For example, while the model runs did seem to simulate the observations (Figures 5 and 2), it is not clear that this was achieved by use of input parameters that exactly matched the real world.

RESPONSE: We used the empirical equations from SCS-CN to calculate for the Curve Number of each sub-basin. The soil group that we used is stated as Type II. This is pertaining to the Antecedent Moisture Classes (AMC) that we used and not the soil group. Therefore, we have added a discussion on the group of soil in the Marikina River Basin–that is 50% Group B (Shallow loess, sandy loam) and 50% group C (Clay loams, shallow sandy loam, soils low in organic content, and soils usually high in clay).

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The Type II AMC applies for normal conditions (Type I for dry and Type III for wet). This is appropriate choice for the typhoon that happened during the month of September in 2009.

> The input data came from one meteorological station, and that station was not even in the basin. Could the real rainfall intensities have varied considerably over the area of the basin (as would be expected in an area of variable relief experiencing a moving tropic storm)? Obviously, one has to use the available input data, but my point is that this issue needs more discussion in the paper.

RESPONSE: We agree that the rainfall variability over the area of the basin should have been taken into account. However, it is true that the only available data that we have is from a single rain gauge station some 3 km to the west beyond the Marikina basin. We assumed that for this high intensity rainfall is a synoptic condition all over Metropolitan Manila.

> Stated another way, the data (flood peak heights and arrival times) served to test the fit of the model runs, but they did not really test the model against reality, since the such a test must include not just comparisons of model outputs to reality, but also comparisons of model inputs and assumptions to reality. Once again, this is a discussion point that could be added to the present paper.

RESPONSE: We used the interviews to validate the timing of flood peak in six areas along the Marikina River, and for the parameters, as stated in the previous response,

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we have included a discussion on the parameters that we have used in the calculation for the CN.

> It is stated on page 6088, lines 25-26, that the modeled flood peaks on the Marinkina River are, ": : :the highest for a 42-year record (1958-2000) of the country." This statement is ambiguous. Is this the highest for any gauged basin in the country, or is it highest for a basin of this drainage area, or is it highest for the Marinkina basin. It would appear to be the latter, in that a 100-year flood peak of 3440 cms is stated in lines 26-27. However, if this is the case, then the 42-year record of flows on the Marinkina should be provided in this paper, or at least summarized so that the reader can compare it to the 26 September 2009 event.

RESPONSE: This is the highest for the Marikina River Basin. The ten highest discharges in 42-year record have been added in the paper.

Technical corrections There are a number of more minor, technical and editorial points that mar the overall presentation of the paper. These include the following (though these should be considered examples, since I was not able to go over all such points in detail):

> Line 8 of the abstract (page 6082) refers to "anthropogenic factors that exacerbated flooding." However, I was not able to find any information about this fact in the body of the paper. (The abstract should not contain any information that is not already in the body of the paper.)

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Table 1. Ten highest discharges in Marikina

Year	Maximum Discharge (m^3/s)
1986	2650
1970	2464
1959	2072
1977	2051
1966	2036
2000	1895
1998	1680
1995	1676
1999	1642
1967	1609

RESPONSE: There has been documented relation, (though not quantified and published), of the garbage-clogged sewerage systems to the degree of flooding that happened. Other researchers who also did fieldworks after the typhoon have taken photographs of canals that impounded water due to the clogging of solid wastes. And a brief discussion of these reports has been included in the body of the paper.

> Lines 8-9 claim, ": : :the observed flood heights can be simulated in the models generated." The word "generated" is not needed, but a more substantive point is that the model results (Figure 5) simulate discharges, not the observed flood heights.

RESPONSE: We have pointed out that the discharges were generated and not the flood heights. The flood heights were not simulated but rather measured directly in the field and were calculated using the published discharge rating curve.

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The abstract should point out that post-event resident interviews were used to establish that the peak flood flows occurred at different hours along the river (lines 9-10), since this is an important innovation in this study.

RESPONSE: We have modified the abstract to include this significant point.

The sentence in lines 18-19 of page 6083 needs to be rewritten as follows, “The residents were asked to report the time of the flood peak, as well as the estimated maximum height and rate of flood water increase.”

RESPONSE: We have accepted this suggestion and used the suggested sentence in the paper.

The first reference to Figure 3 is made at the bottom of page 6083, but the first reference to Figure 2 is not made until page 6087. This problem for figure placement can be corrected by reversing the numbering of the current Figures 2 and 3.

RESPONSE: We have reversed the number of current figures to correct this inconsistency.

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The paper does not properly cite references by 2 authors. Instead, all papers by more than one author are listed as “et al.” This should only be done when there are 3 or more authors. Thus references to Liu et al. (page 6084 line 18), Usul et al. (page 6084 line 20), Zenger et al. (page 6084 line 20), Chubey et al. (page 6084 line 21), Ludwig et al. (page 6084 line 24), should be, respectively, Liu and De Smedt, Usul and Burak, Zenger and Waalands, Chubey and Hathout, Lugdwig and Schneider.

RESPONSE: We have corrected the way these authors were cited according to the suggested format.

Page 6086, lines 3-4 refer to (Singh, 1994), but this reference is not listed on page 6091.

RESPONSE: We have changed Singh, 1994) to (SCS, 1972). This is because we were able to obtain a copy of the SCS manual that Singh used in describing the SCS-CN method.The reference is as follows: Soil Conservation Service, 1972. National Engineering Handbook, section 4, Hydrology, U.S. Department of Agriculture, U.S. Government Printing Office, Wasgington, D.C.