Response to Anonymous Referee #1

We greatly appreciate your reviewing our manuscript and give us insightful and constructive comments. We would like to address the review comments as follows. In this document, the review comments are in black and our responses are in red.

General comments

The paper is well written and the topic well argued. I suggested minor revisions as follows.

1) Section 3.2

I couldn't understand whether the authors' inundation simulation was acceptable to quantify the sensitivity of inundation volumes. Please revise this section considering the following comments;

- The authors didn't describe well about errors in satellite observation and from the different data sources, UNOSAT and GISTDA. Please clearly describe these errors and their impact on your validation.

In general, remote sensed flood inundation estimation was very effective to understand how large scale flooding happened in different years. However, as the reviewer pointed out, the information always includes uncertainty, which is associated to the choice of water detection index, the selection of threshold and other intrinsic errors in remote sensing (cloud cover, spatial-temporal resolutions etc.). Unfortunately the quantitative assessment of the errors was not available for UNOSAT or GISTDA information, however we will identify the possible errors in satellite based flood inundation with citations of related papers.

- Please describe why the authors could validate the model performance using only from 2005 to 2011.

The main objective of the comparison between remote sensing and model was to diagnose the model ability in representing various inundation situations in flooding years and small flooding years. For this objective, we think even if the period was limited to seven years (when GISTDA and UNOSAT information is available), the comparison provides useful insights into the model performance.

- In last paragraph, the authors concluded average mean error and root mean square error were 1.1 and 1.2 m on floodplains. Please describe these values were acceptable to quantify the sensitivity of inundation volumes.

Our recent publication described the accuracy of our field survey (Sayama et al., 2015). The GPS measurement itself contains about 50 cm errors. In addition, other procedures including level measurements between GPS and flood marks as well as conversions from “water level” to “water depth” with satellite topographic information contain similar degrees of uncertainty. Although, we would like to improve the accuracy of flooding level information in the future, it was our best estimations during the post-flood survey in 2011. In terms of the differences between the model and measurements, we could not address if the bias appear in the similar way in different years due to the limitation of data.

Nevertheless, we evaluated the model performance not only with flood inundation depths but also with river discharge at different locations and consider rainfall and evapotranspiration effects; therefore, we believe our estimated flood inundation volumes over the entire river basin have acceptable accuracy for the proposed analysis.

2) P7041L15-27

In Table 3, ANE and FET showed large different model performances between wider inundation cases and smaller inundation cases. Please explain clearly where these differences come from. Furthermore, please add explanation of impact of these different model performances on DF, dDF, dF, and the authors' conclusions.

In terms of the model evaluation of flood inundation extents, we will add two other indices to characterize the simulation. (This revision also responses to a comment by the second reviewer.)

In the revised manuscript, we will show True Ratio (how much of the simulated extent actually captures the remote sensing) and Hit Ratio (how much of the observed extent is captured by the simulation). These added index explain better why FIT was low for small flooding years and relatively high for severe flooding years. In summary, the reason for the small FIT value in small flooding years was due to the errors in the locations of inundations (e.g. small normalized errors (NE) -0.05 in 2008 and -0.01 in 2009) because it becomes more difficult to have better scores in FIT for small flooding. However, since our concern is in the flood inundation volumes inside the basin and not necessary the detailed locations of flood inundations, comparatively low FIT values in small flooding years do not have significant impact on the elasticity estimations. Furthermore, for years with lower than 950 mm in the six month, rainfall showed so little inundation volumes that the linear regression between rainfall and inundation excluded the values for P < 950 mm as described in Section 4 and Figure 8.

Specific comments

3) P7031L6

"Fig.1" is maybe "Fig.2"?

We will correct it.

4) P7032L9

"Fig.2" is maybe "Fig.1"?

We will correct it.

5) P7033L9-15

Because discharge capacity in the Chao Phraya River decreases from Nakhon Sawan to Ayutthaya written in P7032L14-15, and it is considerable as the different characteristic of Chao Phraya River from general rivers, please add clear explanation about applicability of equations (2) and (3) for the Chao Phraya River.

We did not use the equations (2) and (3) for the main rivers, where the cross section information is available. We will revise the manuscript to make it clear:

Local river depths D [m] and widths W [m] were decided based on cross section information at 121 sections, while for tributaries with no cross section information, we approximated them by Eqs. (3) and (4) (Coe et al., 2008), whose parameters were estimated from regression analysis with the cross section data.

6) P7036L11

"metrices" is maybe "matrices"?

It had to be "metrics". We will correct it.

7) Figure 5b

Because these results were calibrated under the condition of no dam reservoirs, the characteristics of ET in dry and wet seasons were considered different. Why the ET in this figure showed liner relationship in spite of dry and wet seasons?

Regarding the seasonal variations of ET in this region, Tanaka et al. (2008) reported that tropical evergreen forest in the basin has deep soil layer (~5.3 m), which allows fairly steady evaporations throughout a year. Essentially the model behaves also similar way; i.e. stored water in soil layer is evaporated in dry seasons. For the PET, as described in the main text, we used Penman Montieth equation with spatially and temporally variable LAI. As a result, our estimation showed rather stable ET, whose pattern is similar to the previous report (Figure 8 in Tanaka et al. 2003).

8) Figure 7
Please match descriptions in legend with them in body.

We will modify the legend based on the suggestions.

9) P7039L9
There isn't maybe Table 4.

We will add parameters of the regression analysis in Table 4.

10) P8039L17
Please explain clearly why the authors choose “two months” for expansion of period after its inundation peak to better understanding of runoff volume.

We will revise the manuscript as follows:
We decided to extend the water balance calculation period for two months after its inundation peak, so that the inundated water is receded to turn into runoff and other water balance components. We confirm it with Fig. 8 (c), which shows that flood inundation becomes nearly zero when the period is extended for the additional two months.

11) P8039L18-19
"Fig.8a and b" is maybe "Fig.8a and c"?
We will correct it.

12) P8039L18-19

In P7035L8, dF was described as the peak flood inundation for each year. I understood dF showed almost zero in Fig.8c and d; however, I wonder why the authors needed to describe dF in Fig.8c and d despite their independent to better understanding of runoff volume.

We will change the Figure by removing dF plots for the runoff analysis.

13) References

Cherry et al., (2014; DOI: 10.1002/2013WR014845) was newly published as inundation simulation in the Chao Phraya River

Thanks for the suggestion. We will cite this paper in the revised manuscript.

References

1) Tanaka, K., Takizawa, H., Tanaka, N., Kosaka, I., Yoshifuji, N., Tantasirin, C., Piman, S., Suzuki, M., Tangtham, N.: Transpiration peak over a hill evergreen forest in northern Thailand in the late dry season: Assessing the seasonal changes in evapotranspiration using a multilayer model, J. Geophys. Res., 108(D17), 4533, 2003.
2) Tanaka N., Kume, T., Yoshifuji, N., Tanaka, K., Takizawa, H., Shiraki, K., Tantasirin, C., Tangtham, N., Suzuki, M.: A review of evapotranspiration estimates from tropical forests in Thailand and adjacent regions, Agricultural and Forest Meteorology, 148, 807-819, 2008.
3) Sayama T., Tatebe Y., Shigenobu T.: An emergency response-type rainfall-runoff-inundation simulation for 2011 Thailand floods, Journal of Flood Risk Management, 2015 (in print).