

## ***Interactive comment on “On the Relationship Between Flood and Contributing Area” by Christopher Spence and Samson Girma Mengistu***

**Anonymous Referee #2**

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The Spence and Mengitsu manuscript focuses on the characterization of the flood and contributing area relationship for an agricultural catchment in Canada. The flood data is generated using a semi-distributed model (MESH-PDMROF) and the contributing area fraction is generated from the same model with the method from their previous paper (Mengitsu and Spence, 2016). Although this manuscript is well written, I too have concerns regarding the methods of this paper, but will try to focus on the aspects that were not covered by Reviewer 1.

(1) First of all, I disagree with the authors that the MESH-PDMROF model deployed here provides reasonably well simulations. Figure 2 compares the observed and simulated hydrographs, and the model underestimates most of the hydrograph event peaks (by a large margin!) in the 12 year period. This is especially important because the

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study's main focus is on floods. As described by the authors, MESH-PDMROF has a SWAT-like structure. However, to my knowledge, application of SWAT in agriculture dominated catchments requires additional process modules (e.g., a tile drain module). None of that seems to have been implemented here with MESH-PDMROF. Therefore, my suspicion is that the model (as implemented in current form) might be missing some key processes that are important to this catchment. This also brings into question the validity of the contributing area calculations.

(2) The error and bias correction of the data further mangles the situation because of the assumption that the differences in  $Q_{max}$  between the observed and simulated data are proportionate to differences in  $A_c$ . This is a reasonable assumption in itself, but the underlying premise is that any deficiencies in the model can be fixed through a bias correction (which I don't think is appropriate). Therefore, it is unclear what to make of the Q-A relationships and exponent values presented later in the Results.

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