



Zhuo, L., & Han, D. (2016). Could operational hydrological models be made compatible with satellite soil moisture observations? *Hydrological Processes*, 30(10), 1637-1648.
<https://doi.org/10.1002/hyp.10804>

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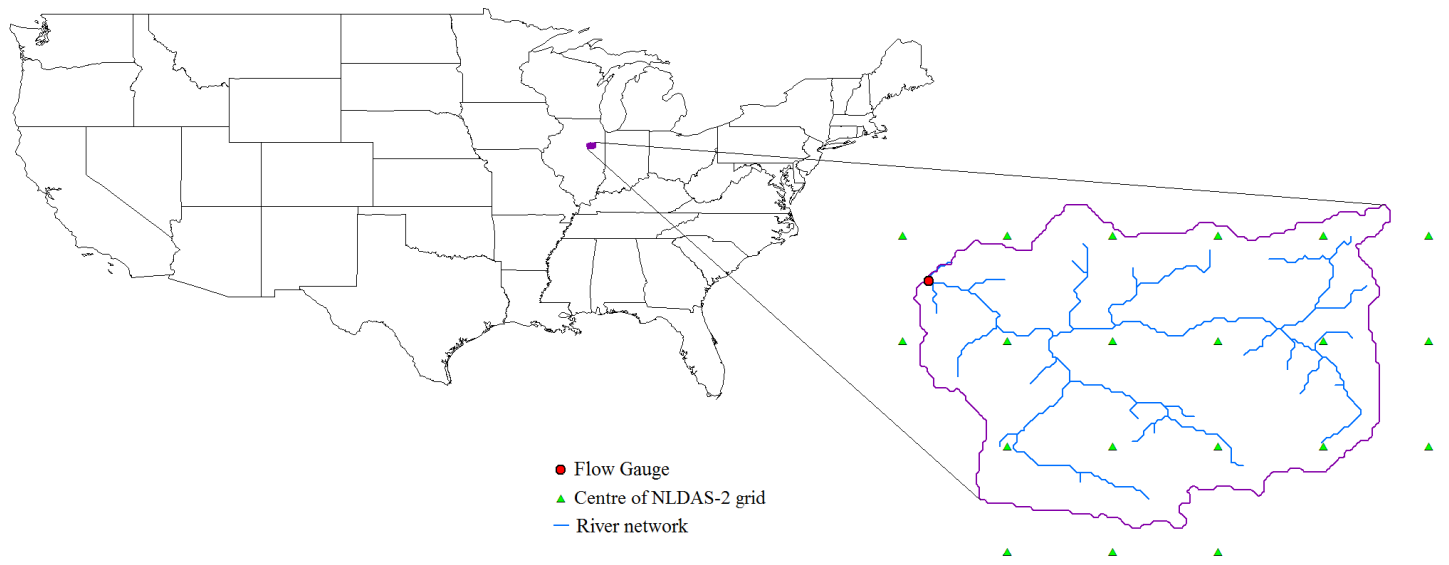


Fig. 1. Location of the Pontiac catchment with the flow gauge and NLDAS-2 grid points over the river network

[\[Zhuo et al., 2015a\]](#).

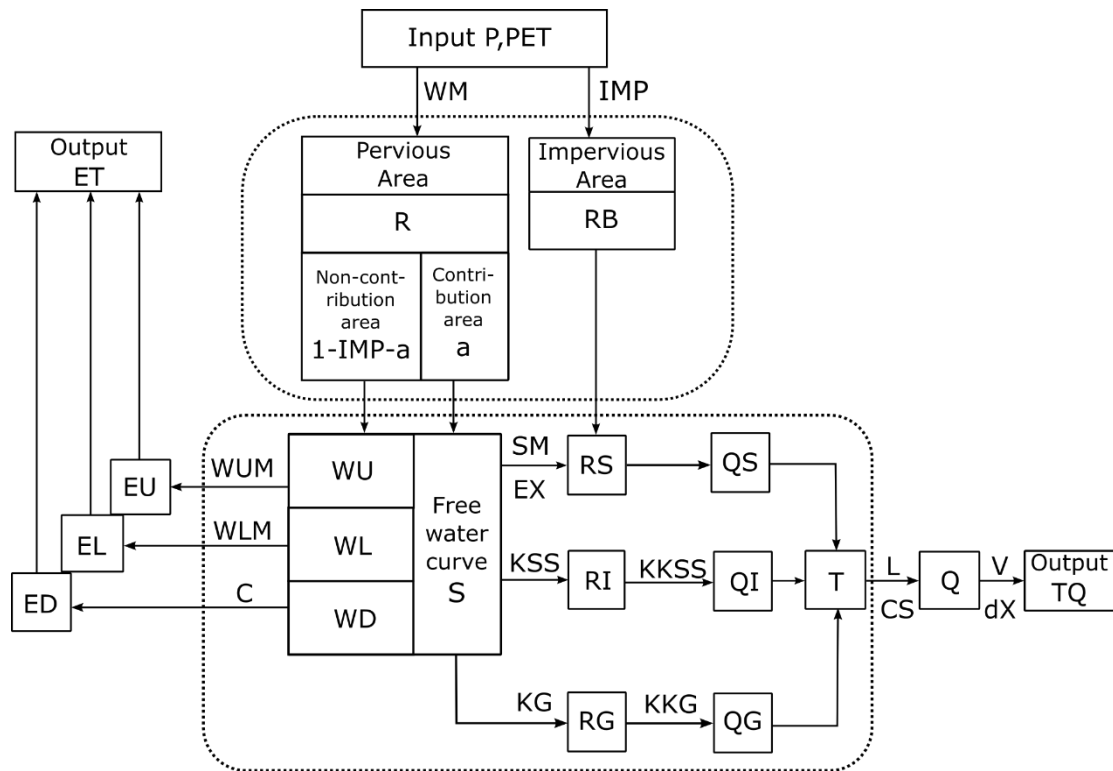


Fig. 2. Adopted flowchart of the XAJ model (Zhao, 1992), where WU , WL and WD represent the upper, lower and deep soil layers' areal mean tension water storage respectively; EU , EL and ED stand for the upper, lower and deep soil layers' evapotranspiration output, respectively; S is the areal mean free water storage; a is the portion of the sub-catchment which is currently producing runoff; IMP is the factor of impervious area in a catchment; RB is the direct runoff produced from the small portion of impervious area; R is the total runoff generated from the model with surface runoff (RS), interflow (RI) and groundwater runoff (RG) components respectively. These three runoff components are then transferred into QS , QI and QG and combined as the total sub-catchment inflow (T) to the channel network. The flow outputs Q from each sub-catchment are then routed to the catchment outlet to produce the final flow result (TQ).

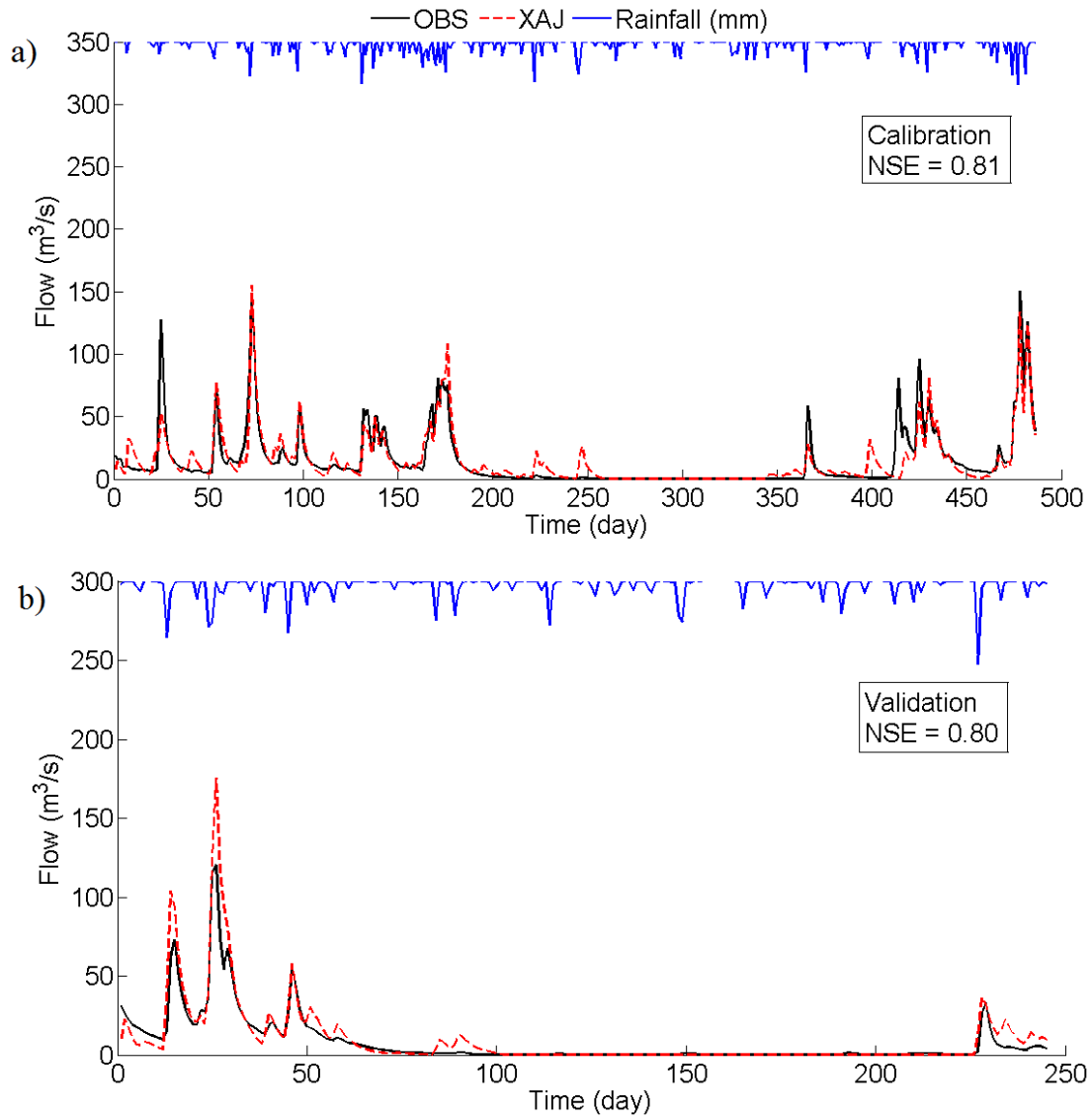


Fig. 3. Time series of daily rainfall and daily averaged flow for the Pontiac catchment, during calibration (a) and validation (b) periods [Zhuo et al., 2015a].

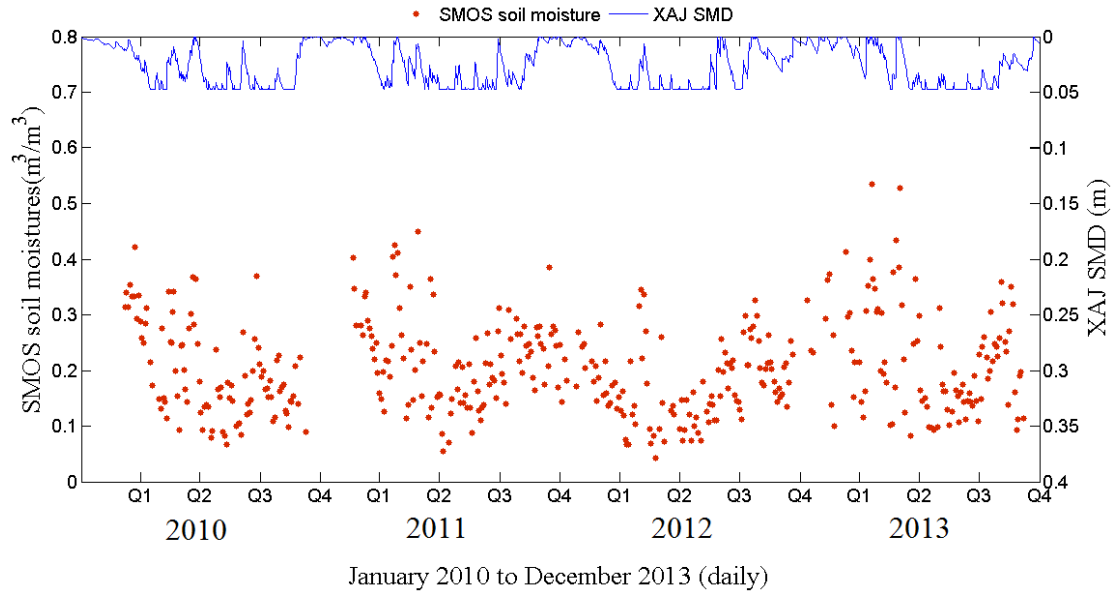


Fig. 4. The time series of soil moistures from the SMOS descending orbit and XAJ surface SMD, where x-axis is in the quarter year format.

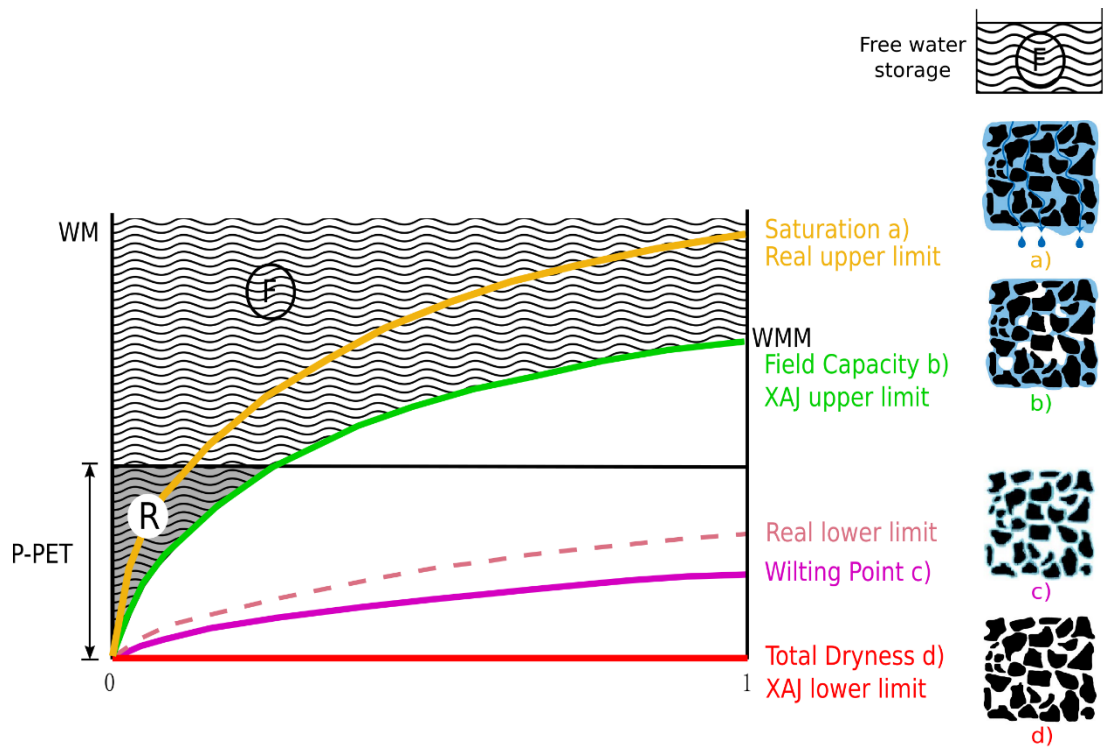


Fig. 5. The distribution of the tension water capacity in the upper soil layer of the XAJ model, with visual comparison of the four soil moisture states in the field situation against the soil moisture boundaries adopted in the XAJ model, where R stands for the total runoff generated from the model and F is free water above field capacity.