Supplementary Materials

Table S1 Description of validation points

No.	Longitude(°E)	Latitude(°N)	Validation	Description
VP1	106.60	29.69	1	Baotong Road, Yubei District
VP2	106.48	29.53	1	Chenjiaping Interchange, Jiulongpo District
VP3	106.47	29.48	1	Chaoyangsi Interchange, Dadukou District
VP4	106.45	29.55	1	Southwest of the intersection of G319 and Tian Chen Road, Shapingba District
VP5	106.45	29.54	1	Fengtian Road, Shapingba District
VP6	106.48	29.53	1	Chenjiaping Interchange, Jiulongpo District
VP7	106.51	29.65	0	Kunlun Hospice, Yubei District
VP8	106.57	29.50	1	Xuefu Avenue, Na'nan District
VP9	106.47	29.56	1	Hanyu Road, Shapingba District
VP10	106.60	29.65	1	Shangwan Road, Yubei District
VP11	106.46	29.52	1	Orchid 5, Jiulongpo District
VP12	106.47	29.53	1	Rubber Gate under the Bai Ma Cai flyover, Jiulongpo District
VP13	106.49	29.53	1	Keyuan Sanjie, Jiulongpo District
VP14	106.49	29.50	1	Shuimian Interchange, Jiulongpo District
VP15	106.51	29.50	1	Taohuaxi Bridge, Jiulongpo District
VP16	106.56	29.48	1	Yunan Diversion Road, Ba'nan District
VP17	106.51	29.53	1	Yuanjia Road, Jiulongpo District
VP18	106.52	29.39	1	Ba Xian Avenue, Ba'nan District
VP19	106.64	29.25	0	Xinya Village, Ba'nan District
VP20	106.57	29.57	1	Grand Theatre [Subway Station], Jiangbei District
VP21	106.32	29.51	1	Gao Xin Avenue, Jiulongpo District
VP22	106.54	29.46	1	Hongguang Avenue, Ba'nan District
VP23	106.60	29.68	1	Huixing Interchange, Yubei District
VP24	106.57	29.54	1	Nanbin Road, Na'nan District
VP25	106.56	29.73	1	Tongmao Bridge, Yubei District
VP26	106.50	29.62	1	Starlight Avenue, Yubei District
VP27	106.54	29.56	1	Niujiaotuo Interchange, Yuzhong District
VP28	106.37	29.58	1	No.9, Building 26, Xiyong II Resettlement House, Shapingba District
VP29	106.42	29.82	1	No.216 Tiansheng Road, Beibei District

Supplementary—Sensitivity analysis of hydraulic conductivity

Two metrics (i.e., Fit statistic (F) and Root Mean Square Deviation (RMSD)) were used to quantify the degree of matching and variation between model predictions respectively. In each case, the Ks = 0.001 simulation was used as the reference and both measures are calculated against this reference. F is widely used for evaluating the goodness of agreement between predicted flood extent and the reference [1]. It varies between 1 for a perfect fit and 0

when no overlap exists. It can be calculated as follows:

$$F = \frac{A_0}{A_r + A_s - A_0} \tag{1}$$

where A_r is the referenced wet areas, A_s is the predicted wet areas, and A_0 is the overlap of A_r and A_s.

The RMSD is particularly suitable for evaluating the overall agreement/discrepancy of water depth between two paired results on a cellby-cell basis [1]. It can be defined as follows:

$$RMSD = \sqrt{\frac{\sum_{i=0}^{n} (d_i^s - d_i^r)^2}{n}} \tag{2}$$

where d_i^s and d_i^r are the predicted and referenced water depths respectively, i is the index of the wet cells and n is the total number of wet cells in the prediction and observation.

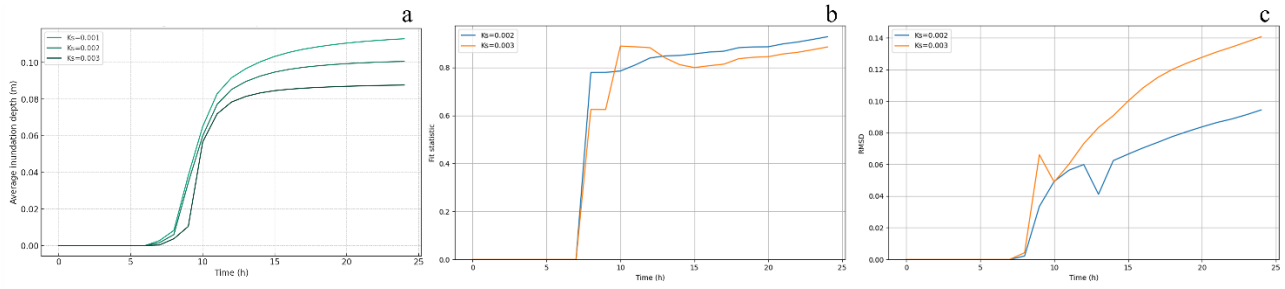

Figure S1. Sensitivity analysis of hydraulic conductivity.

The model was found to be very sensitive to the specification of hydraulic conductivity (Figure S1) and a small variation of this parameter results in a notable change in the depth of inundation (Figure S1a). The simulation with a Ks value of 0.001 is used as the reference simulation and RMSE and F are calculated over time. RMSE and F statistic (Figure S1b and c) also demonstrate the spatiotemporal variation of model predictions. Model calibration shows that the model is highly sensitive to soil hydraulic conductivity (Ks). With a 0.001 m/h decrease of Ks, an average increase of 0.126 m of inundated depth is predicted. This is due to the amount of reduced infiltration associated with a smaller hydraulic conductivity value. This observation reveals that flood inundation is highly uncertain in the rapidly developing area, particularly for long-term predictions.

Reference:

1. Yu, D.; Coulthard, T.J. Evaluating the importance of catchment hydrological parameters for urban surface water flood modelling using a simple hydro-inundation model. J. Hydrol. 2015, 524, 385-400, doi:https://doi.org/10.1016/j.jhydrol.2015.02.040.