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Interactive comment on "A non-stationary model for reconstruction of historical annual runoff on tropical catchments under increasing urbanization (Yaoundé, Cameroon)" *by* Camille Jourdan et al.

Anonymous Referee #2

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The scope of this paper is to develop a combined approach of data acquisition and the development of a new semi-distributed model taking into account land-use changes to reconstruct and predict annual runoff on a catchment exposed to high urban increase. The research question is interesting, and the methods used in this study are well explained. However, I have some major comments listed below. 1. Lines 122-123: How about potential evaporation? The effect of potential evaporation on annual runoff may need to be incorporated into the model. 2. Line 139 equation (1): how is this equation obtained from SCS curve number method applied to the annual scale? 3. The effect of inter-annual soil water storage carry-over is not considered. As shown in Lines 357-358, there are humid (1960-1970, 1980-1990, and 2006-2013) and dry (1935-1950,

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1970-1980, and 1990-2000) periods. The storage carry-over from the transition between wet and dry periods may be not negligible. 4. Lines 358-362: The change of seasonal rainfall pattern will affect the annual runoff. It will be good to explore or discuss the potential impact. 5. Figure 7: Considering the annual runoff coefficient, the uncertainty for the linear model between runoff coefficient and precipitation is large (i.e., the scatter of data points around the line). This is due to the following potential reasons: 1) the validity of equation (1); 2) the effect of potential evaporation; 3) the effect of inter-annual soil water storage change; and 4) the effect of seasonal variation of precipitation. 6. In this paper, the temporal change of I is used to model the effect of land use change. However, the land use change may be better to be reflected in the parameters of the rainfall-runoff relation (e.g., A and B parameters). What are the estimated values of A and B? The parameters A and B have physical meanings. For example, soil water storage capacity is an important parameter in the SCS curve number method, and it is a function of land cover and land use. Land use change will cause the change of soil water storage capacity. Some minor comments: Lines 29 and 117: kmˆ2? Same for other places. Line 30: change “an” to “a” The Abstract section could be shortened. Line 59: change “anthropic” to “anthropogenic”? Line 72: delete “people” Line 95: change “as” to “of”? Line 103: change “recently” to “recent” Line 124: “short-terms” to “short-term”? Line 139: APˆ2 Line 175 and Figure 1: Why is β_2 similar for all values of P? Why are the upper bound and lower bound of Figure 1a in parallel? Line 396: Px=200mm? May be a typo. Line 433: change “(U” into “U” Line 461: “quite clear in term of runoff with for D14 runoff value up to 160 mm. . .” There is a typo, it should be D12 not D14. Line 499: A “ ” is missing after “consequently”. Line 531: There are 12 donors totally, but only 10 donors were considered. Which two were excluded and why? Lines 542-544: According to this sentence, i.e., “From the sensitivity analysis, we calibrate a and b, choosing the set of 8 from 10 donors giving the lowest values of RMSE on the 15 years calibrated period”, we know that 8 donors were used to determine the value of a and b. But the following sentence says you used 9 donors: “We use the 9 donors DH2, DH3, DH4, DH6, DI2, DI3, DI4, DI5 and DI6”.

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So it is not clear how many donors were used. Lines 548-550: Is there any specific reason for plotting the points of Etoa in Figure 11? Lines 550-552: When DH3 and DI2 are used for the first level of validation, both E are larger than 0, is that because using the calibrated a and b would overestimate the hydrological index? Lines 582-583: T2 and T8 also have different precipitation according to Figure 6d. Therefore, how much difference in runoff between T2 and T8 is caused by the difference in precipitation?

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