

## ***Interactive comment on “Comparing impacts of climate change on streamflow in four large African river basins” by V. Aich et al.***

### **Anonymous Referee #2**

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**General Comments:** The paper presents an analysis of the impacts of climate change on the streamflow of the the Niger, the Upper Blue Nile, the Ubangi and the Limpopo basins using the SWIM hydrological model and an ensemble of 5 CMIP5 models. This work is one of few examples which draws comparisons between sub-Saharan African river basins. The methodology used and the conclusions drawn are sound, and the manuscript is well structured. However, clarification is required surrounding the reasoning for the selection of the basins and the on both the spatial and temporal modelling scale.

**Specific Comments:** P13008 & P13009: The reasoning behind the choice of the four river basins needs to be clarified. The authors state that the river basins chosen cover the “main Sub-Saharan climate zones”. Which climate zones are these and on which

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classification are they based? The statement by the authors that “they are all highly dependent on the weather conditions, as their economy is mainly based on the primary sector” is confusing and needs to be clarified. Was the climate and the dependence thereon the sole reason for the selection of these basins?

P13009/13010: Differing catchment rainfall and discharge do not make the catchments “extremely heterogeneous”.

P13011, L4: “This geographical setting results not only in a typical subtropical intra-annual, but also a very distinct inter-annual variability of flow”. This statement contradicts an early statement that all for four catchments were “classified as tropical” (P13009). Following this, the next paragraph refers to the Limpopo basin as arid to semi-arid.

P13011, L19: Sentence needs revising and clarification - “part of them are considered to have extensive impacts on water resources”.

P13011, L21: Sentence needs revising and clarification – “However, water management does not play a major role and currently there are only five major reservoirs in the catchment with volumes of over 1000Mm–3, mainly built for irrigation and hydropower: Selingué (Mali), Kainji, Jebba, Shiroro (all three Nigeria) and Lagdo (Cameroon).”

P13011: Section 2.2 Water management in the basins. The title of this section is misleading. The section focuses on the number and size of reservoirs and irrigation in the catchments, it does not discuss the how the water is managed per se.

P13013: The discussion surrounding the modelling scale needs clarification. How does the scale at which the model simulates relate to the objectives? What are the typical sizes of the “subbasins and hydrotopes”? Are hydrotopes homogeneous hydrological response units? On what basis is the subdivision into these units done?

P13014, L21: “The climate scenarios have been downscaled” – is this referring to the ensemble of 19 or the selected 5 ESMs? The authors state that both the RCP 2.6 and

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8.5 scenarios were used, for each of the 19 or 5 models were both RCP's used or only one per model? Please clarify.

P13015, L1: Table 3 does not show the period for calibration

P13015, L6: The differences between subcatchments, subbasins and hydrotopes needs to be clarified. Was the modelling still undertaken at the hydrotope scale and the flows accumulated to subcatchment scale? The results for the calibration/validation at the 18 gauging points is not shown in Table 3 (similarly only results for one of the gauging points in the Limpopo is shown) – why was results from only one gauging point for the Niger and Limpopo basins shown?

P13017, L10: The authors discuss the model representation of high and low flows. How were these assessed? How are high and low flows defined? Related to this, what is the time-scale of the modelling? Is the model run daily and the results aggregated to monthly? Are the statistics on validation based on monthly or daily results?

P13017, Sect. 4.2: I am unsure of the reasoning behind the presentation of the bias-corrected vs uncorrected scenarios. Please clarify.

P13026, Sect. 5.2: Comments on whether changes in flows correspond with previous studies. The seasonality in the title indicates a discussion on changes in the timing of high/low flow periods, which the section does not address.

P13029, L22: None of the ESMs seem to represent the high flow peak for the period from 1970 in the Limpopo basin well, the Hadley model overestimates while the other models underestimate. This needs to be acknowledged in the uncertainties.

Technical Comments: P13014, L11: “was applied to calibrate” – change applied to used P13014, L16: “they practically cover” – remove practically

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