

## ***Interactive comment on “Detecting the long-term impacts from climate variability and increasing water consumption on runoff in the Krishna river basin (India)” by L. M. Bouwer et al.***

### **Anonymous Referee #3**

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#### General comments

The paper gives a well written overview of the analysis of simulations of runoff from the Krishna river basin with STREAM, including an assessment of the effect of manmade changes to the basin (mainly reservoir building) on the annual amount and timing of the runoff.

Apart from a number of details the paper is well written, the methodology straightforward, the conclusions supported by the results, and the scientific value of the work relevant. As such, the paper is acceptable for final publication after minor revisions.

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## Detailed comments

¶ In the abstract: indicate that the runoff values are mm/year

¶ 3rd line from below: “Variation in runoff UNDER natural”

¶ It is a bit confusing to denote increasing water consumption as a reason for reduced variability in this stage. The mean runoff goes down (which is one manifestation of variability), increasing the relative variability.

¶ p 2, 6th l: Start new sentence before “in particular”

¶ p 3, 2nd par, l 3: “studies OF water availability”

¶ Last par on this page: “the goal IS this study ARE to”

¶ It is not clear why hydropower gives a net consumption of water (apart from increased evaporation from reservoirs)

¶ p5, middle: “Electricity IS produced”

¶ P6: “equalled” -> “was equal to”

¶ Start 3rd par with “Observed discharge data were converted into areal fluxes (kg/m<sup>2</sup> d) using the basin size as reported by V et al (1998). The storage capacity”

¶ You may add a comment that the presence of storage reservoirs consumes water first to fill the reservoir, and later to allow for extra irrigation.

¶ P 6, last para: “have beEN”

¶ The sentence “what variation in both” is a bit confusing. What is implied here?

¶ p 7, 2nd line: start new sentence after “,1993).”

¶ “in various forms FOR climate and”

¶ A comment could be added what information is exactly added by using the 3x3 km

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data, when the climate data are only at .5 x 0.5 degree.

┆ Why is the (fairly short) first 15 yrs of the 20th century chosen for calibration?

┆ “Performance WAS assessed.”

┆ p 8: was there also a human influence in the beginning of the 20th century?

┆ Start 2nd para with “Annual maximum monthly mean runoff is ”

┆ “parameters” -> “variables”

┆ Rephrase: “Fig 5 shows the effective precip (total annual precip minus actual evap) for the extreme of 1988. During 1972”

┆ P 9, top part: it is important to indicate already here (and not at the end of this section) that the simulations of 1960 and beyond act as a reference to detect human factors not included in the simulations. Indicate that the supposed reason for the lack of correspondence between obs and model is the lack of representation of reservoirs in the model.

┆ Second par, 2nd sentence: rephrase as “The estimated coefficient of variation (cv), defined as, was approx 1.5 times and 1960. Until the period 1946-1960, the variability in annual runoff closely follows the changes”. And use cv in the following text, instead of “coefficient of variation”.

┆ Rephrase last sentence of 4.3: “Taking into account the overestimation of the modelled cv, it appears that 2/3 of the current variability total runoff.”

┆ 4.4: what is implied by “residual”?

┆ “normalized” -> “relative”

┆ Section 5: it needs more clarification how the adjusted model was able to change the irrigation water use. In fact, the adjustment in eqs 2 and 3 would only lead to a time shift in runoff, not to a net change of the annual runoff (which is the key thing

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when looking at fig 4). While reading through this part I wonder why you didn't fix the water consumption by changing the formulation of evaporation. Please explain what happened here a bit better. It also helps following the concluding text in section 5.

¶ p 12, bottom: refer to "annual" runoff when mentioning the "mms"

¶ p13 top: indicate that the decreased variability is estimated from the simulations without including the reservoir component.

¶ Figs 2 and 4: can you make a distinction between the line thicknesses, clearly separating the raw curve from the smoothed time series?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 1249, 2006.

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