

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 #1

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General Comments —————

In general, the paper is interesting and relatively well written. It addresses a relevant question within the scope of HESS. The conclusions are useful for the scientific community, as they allow a quantitative estimate of the effect of human water use for runoff variability in the studied region (an aspect which is also relevant for other regions of the world).

My only negative comment is that the text is in part a little confusing (in particular in the abstract), because the employed terminology with regard to the factors controlling runoff variability is not always systematic. The authors should clearly define the follow-

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ing three aspects: a) variations of runoff due to natural climate variability; b) variations of runoff due to (anthropogenic) climate change; c) variations of runoff due to human water use. (Aspects a) and b) could be combined under the term "observed climate variability".) When referring to these 3 aspects in the text, the same terminology should always be used.

Finally, the paper could benefit from an additional perspective on the impact of climate change (factor b) above). What is the possible contribution of this factor to the runoff variability in this region? How does it compare with the impact of human water use (factor c)?

Detailed Comments —————

1) abstract, p.1250, l.8: "Runoff under climate variability and increased water consumption for irrigation and hydropower is simulated [...]"; replace with "Runoff variability due to observed climate variability and increased water consumption for irrigation and hydropower is simulated [...]"

2) abstract, p.1250, l.10: "for the last 100 years"; replace with "for the last 100 years (1901-2000)".

3) abstract, p.1250, l.13-16: "Variation in runoff under natural climate variability only [...]"; should be likely replaced with "Runoff variability due to observed climate variability only [...]", as the observed climate variability also includes variations due to climate-change (which can thus not be encompassed by the term "natural climate variability").

4) introduction, p.1252, l.3: Replace "studies into water availability" with "studies on water availability"

5) introduction, p.1252, l.19: Replace "relative impact of variation in climate versus anthropogenic changes on runoff at the river basin scale" with "relative impact of the observed climate variability (natural and due to anthropogenic climate change) versus human water use for runoff variability at the river basin scale"

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6) section 4, p.1256, l.3: Replace "arises how much water would have be" with "arises of how much water would have been"

7) section 4.1, p.1256, l.12 (STREAM model): It looks like the main climate inputs to the model are precipitation and temperature; changes in radiation (e.g. due to increased greenhouse gas concentrations or aerosol loads) could also have an impact on the water balance of the region, though they are not included in the model (except indirectly through temperature). I would add a comment on this point somewhere in the text.

8) section 4.2, p.1257, l.18: "in particular when taking into account the high degree of human intervention in the hydrological cycle in this basin"; Does this comment apply to the period 1901-1915?

9) section 4.2., p.1257, l.28: I don't quite agree with the statement "is approached reasonably only in absolute terms"; there are some quite large differences even just in mean runoff for the time period 1961-2000. This sentence only applies to the time period 1901-1960.

10) section 4.3, p.1259, l.2: How do you explain that the simulated coefficient of variation is approximately 1.5 times higher than for the observations? Can this be explained with some specific deficiencies of the employed model?

11) section 4.3, p.1259, l.11: "Taking into account the overestimation of the model"; replace with "Assuming that the model also overestimate the coefficient of variation by 50% in the periods 1965-79 and 1989-99 (as in the periods between 1901 and 1960, see above)". This is just an assumption, as it is possible that the model bias regarding the coefficient of variation varies with time.

12) section 4.3, p-1259, l.14: "It appears therefore that two thirds of the current variability in runoff [...]"; replace with "It appears therefore that two thirds of the current variability in runoff (as defined with the coefficient of variation) [...]". Note that since this change may be only due to changes in mean values rather than changes in stan-

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dard deviation, this sentence could be misleading for the reader.

13) section 4.4., p.1259-1260: "This decreased further to approximately less than a third on average"; replace with "This decreased further to approximately less than a third on average for the period 1991-2000"

14) section 4.4., p.1260, l.11: "other than climate variability"; replace with "other than observed climate variability"

15) section 4.4., p.1260, l.19: "This is particularly clear for the period 1951-1960 in Fig. 6". How about the high values for the period 1991-2000?

16) section 5, p.1262, l.6: The fact that the estimated amount of extracted water compares well with the estimated decline reported earlier in the paper is not surprising as the same data is used as basis for the two estimations (the model representing the increased water consumption is calibrated on the same data).

17) Table 1, p.1270: Please also add the standard deviation values for precipitation and runoff; this would be a useful addition as the coefficient of variation is dependent on the mean value and thus changes in CV may reflect changes in mean rather than changes in variability itself (see also comment 12))

18) Table 3, p.1271: Same comment as 17)

19) Fig. 1: Replace "major cities and the discharge gauging station" with "major cities (squares) and the discharge gauging station"

20) Fig. 5: Please outline the contour of the river basin as the zero values cannot be distinguished from the background.

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

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