

Interactive comment on “Hydrologic effects of land and water management in North America and Asia: 1700–1992” by I. Haddeland et al.

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The paper describes the impact of land and water management on hydrological components like evapotranspiration and runoff for the regions of North America and Asia. The manuscript is well written, new and original and would certainly stimulate the scientific discussion. The content of the paper fits very well to the scope of the journal. I would therefore recommend to consider it for publication in HESS. However, I would like to see a few comments and remarks addressed in the final version of the paper:

General comments:

1) The paper would highly benefit from some estimates of the possible uncertainty of

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the simulation results. In the discussion section (page 2909, lines 13-30) some limitations and known uncertainties are listed but it is difficult to understand which specific (quantitative) impact these factors might have on the model results and on the major findings of the study. Maybe that it would help to structure the uncertainties into the groups "uncertainties introduced by input data sets" and "uncertainties caused by the model structure". Are there some independent measurements or observations that would prove the main results of the study?

2) It is sometimes required to read previous papers of the authors to understand the methodology and terminology used here. For example the terms "irrigation water requirement" and "irrigation water use" appear first time on page 2907 but the difference between both was not described before. Another example is: "Current land cover data (topography, vegetation, soil) and meteorological data are the same as described in Haddeland et al. (2006b)." (page 2903, lines 7-8). It would be very nice if the authors could give here a very short summary of the used input data before referring to the reference paper for the details, even if the manuscript would become it little bit longer. This would in particular facilitate understanding of readers who don't have access to all the journals listed in the reference section (please consider that HESS is an open access journal).

Specific comments:

3) The title of the manuscript could be more precise. Wouldn't it be better to mention runoff and evapotranspiration directly instead of "hydrologic effects"?

4) What is the exact meaning of the term "runoff" as mentioned in the manuscript? In my understanding runoff would be more a local phenomenon. If runoff is "routed to the basin outlet through a channel network" (p. 2902) I would prefer to speak of discharge. Maybe that the authors could add one sentence which describes more exactly what they are meaning.

5) Section 2.1 Hydrology model: Is evapotranspiration from open water in reservoirs

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considered in the model? According to other studies (e.g. Shiklomanov, 2000) this is a major water use that has more effect on the quantity of river discharges than the sum of municipal and industrial water uses.

6) On page 2909, lines 22-24 the authors tell that "irrigation water use is most likely somewhat underestimated given that groundwater withdrawals are not included". Would it be possible to quantify this effect for example by comparing irrigation requirements to irrigation use? I would also expect that the seasonal effect is much larger than the annual one because groundwater acts as a reservoir that is also available when surface water is scarce.

7) Page 2910, lines 15-18: I cannot understand why the construction of dams resulted in a stream flow to the Arctic Ocean is now 20 - 40 percent higher in March than historical stream flow. I would expect that reservoirs have a more balancing impact on stream flows by cutting the peak flows and increasing stream flow in low flow situations. Therefore I would expect that parts of the melting water is caught by reservoirs and stream flow should be lower in March.

8) Figure 5 on page 2919: I'm a little bit surprised that there is no significant impact of either landuse (Fig. 5a) nor reservoirs and irrigation (Fig. 5c) on evapotranspiration for the area of the Arabian Peninsula. However, it is well known that evapotranspiration is much higher in irrigated oases than in the surrounding desert. Maybe that the effect is caused by the limited consideration of groundwater resources in the model itself. If irrigation water is only extracted from surface water bodies or reservoirs it might be very difficult to withdraw any water for irrigation in this region. I would appreciate if the authors would add a discussion on this issue.

9) Figure 6 on page 2920: I would like to see also a tabular representation of the simulation results for the different components of the water balance because this is the major finding of the study.

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