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Hydrology and Earth System Sciences Discussions

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

I. Haddeland et al.

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Reply to (1): Quantifying the uncertainties in the simulation results would have been an interesting, but unfortunately a difficult task. We agree that the uncertainties could be structured somewhat better, and we will make an attempt to do so in a possible revised version of the paper.

The VIC model itself has been extensively evaluated using river basin and point flux data both continentally (Maurer et al, 2002), globally (Nijssen et al, 2001), the pilps-2e project (Bowling et al., 2003), and has been shown to reproduce the water cycle well when the forcings are known. The reservoir and irrigation model is evaluated in the papers referred to as Haddeland et al (2006a, 2006b), which also include a simple sensitivity analysis of reservoir model. Some sentences summarizing the model

evaluation will be included in a revised version of the paper.

The results we get are conditional on the input datasets. At the continental and annual scales, the simulated changes in runoff and evapotranspiration caused by human activities are relatively minor (Figure 5), and the results would probably end up being rather minor even if e.g. the reconstruction of cropland areas and irrigated areas are somewhat off. However, at the local and seasonal scale the results will be more sensitive to the input data used. Uncertainties in the input data (e.g. historical vegetation, dams, irrigated areas, forcings) are not discussed extensively, and we agree that this issue deserves some more discussion in the paper. The quality of these datasets is discussed in the papers where they are described, and we will include a discussion on this issue and how this might affect our results.

(2): The reviewer has a good point, and in the revised version we will include definitions of the terms used, and a short description of the input data.

(3): We have discussed the possibility of mentioning "runoff and evapotranspiration" in the title, e.g. by renaming the paper to "Land and water management in North America and Asia (1700-1992): Effects on runoff and evapotranspiration", but we actually prefer the current title.

(4): We agree that the use of "runoff" might be a little confusing in the paper at the moment, and in a revised version we will thoroughly go through the usage, and try to be more specific as to when we talk about surface runoff/baseflow generated within a modeling grid cell, and when we talk about streamflow in channels, and we will define the terms.

(5): Yes, evapotranspiration from reservoirs is considered in the model, and this will be stated in a future version of the paper.

(6): There is a short discussion of this issue in the paper referred to as Haddeland et al. (2006b), and this will be indicated in the revised paper.

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(7): For the Arctic Rivers, the highest discharges are observed in May, and at that time the reservoirs do decrease streamflow compared to the naturalized situation. In March, however, it is still cold, and naturalized streamflow values are low. Hence, the presence of reservoirs increases streamflow in March. A sentence or two on this issue will be included.

(8): The reviewer is right - for the Arabian Peninsula there are no reservoirs included in the model setup, and since groundwater extractions are not included, the evapotranspiration increases are rather small. There is a small increase in evapotranspiration, though, but with the intervals used in Figure 5 these increases do not show up. In a revised version of the paper we will consider changing the intervals somewhat, and include a short discussion of the Arabian Peninsula.

(9): The reviewer is right that Figure 6 is the major finding of the study, and we can of course include a tabular representation of the results.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 2899, 2006.