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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evolving water science in the Anthropocene" *by* H. H. G. Savenije et al.

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General Comments

The authors tackle an interesting and challenging subject: to summarize the ongoing changes in human-water relations, especially from human control toward more general stewardship. The content of the article is good and having such a summary on hand is likely to be broadly useful in the future. My only two general comments concern the organization of sections and the discussion of groundwater. I found the organization adequate but somewhat difficult to follow. This was in part due to the very numerous headings and sub-headings, which broke the manuscript into a very large number of small pieces. Also, I found myself trying to interpret the "story" in chronological order, because the ideas seemed to be presented in an order roughly - but not precisely - paralleling their real sequence of ocrruance in the world. An easy fix that would

greatly have aided my reading would be to make the organization explicitly chronological, with a clear statement at the beginning of each section of the absolute (or relative) time period that section addresses, and perhaps even a schematic figure depicting the chronological sequence of conceptual developments over time. I suspect that in placing dates to concepts (as was done somewhat in the first paragraph of page 7622), one may find that the timing and sequence of events described is somewhat specific to the "developed world". It would be highly interesting – and perhaps really necessary if this is to be a comprehensive treatment of the topic – to add a section discussing alternate paths of the evolution of water science (e.g., perhaps skipping over some steps) in the "developing world". As mentioned by another reviewer, groundwater seems to be de-emphasized relative to surface water and watersheds – I think disproportionately so. There exists a much larger volume of fresh groundwater resources compared to surface water. Although perhaps only 1/5 or so of freshwater withdrawals in the U.S. (for example) are from groundwater, this (non-negligible) fraction has been increasing and is much higher (up to 100%) in some regions of the world. Perhaps a section could be added to explicitly discuss the changing perspectives on, and mix of use of, groundwater vs surface water over time.

Specific Comments

I believe a more precise definition of the 'Anthropocene', and especially its "start date" would aid readers. The manuscript states that the Anthropocene starts at the Industrial Revolution, but this is a broad and moving target date that also risks an (unintended?) Euro-centric view unless more precisely defined. Clarity would be enhanced by greater specificity in the use of some terminology that implies a value judgment. Such terms include: "sustainable" (to what, whom, for what purpose? as in pg 7621 ln 28), "need" (to what end, why? as in pg 7622 ln 18), "society" (which society, culture, etc. and when? as in pg 7625 ln 4), "probably half" (as in pg 7636 ln 10). Used alone, without clear definition or modifiers (such as would answer the questions posed just above), these terms are quite vague and may be (problematically) interpreted in different ways

by different readers. The connection between ecohydrology and sociohydrology - how ecohydrology has led to sociohydrology (as claimed on pg 7628 line 19) - was not clear to me. There were a number of instances where I would have liked citations indicating supporting evidence for specific claims made in the text. Without such evidence the claims seemed out of place. These included: pg 7623 ln 8-24, pg 7624 ln 5, pg 7627 ln 7-11 and 24, pg 7638 ln 1-8. Although the idea of hydrologic ecosystem services is invoked, key references are missing. A brief search of (hydrologic AND "ecosystem services") suggests at least: Jackson et al. (Ecological Applications) 2001, Brauman et al. (Annual Review of Environ and Resour) 2007, and so on. Spatially distributed estimates of actual evaporation and of biomass production have been completed using remote sensing data for some time now, not just beginning in 2010 as the text would suggest (pg 7634, line 28) – suggest amending to credit volumes of earlier work on the subject. The title might be more precise as "Evolving water management perspectives in the Anthropocene" but the wording is of course up to the authors. Is Falkenmark the only researcher deserving credit for the idea of "green water resources"? (pg 7628, line 1) It is not my field so I don't know, I just wonder. What is meant by the term "national water savings" pg 7630 line 8? And what is meant by the term "water value" as used in the succeeding paragraph? My reading would have been greatly aided by a definition in the text, in addition to the references provided.

Technical Comments

The parenthetical phrase near the beginning of section 2.2 is very long. Usage of the term "base flows" should be changed to "minimum flows", which is the meaning intended by the text to refer to concepts such as environmental flows that humans might choose to release in order to continue to support aquatic ecosystems. ('base flow' can instead specifically refer to river flow maintained by gains from groundwater seepage, generally without human intervention.) The term "privatizing" (pg 7634 line 20) is ambiguous: "public" and "private" can have opposite meanings in different locations (e.g., public vs. private schools in the UK vs. the U.S.). Suggest amending pg 7635 line 12 to

"...or the change in storage in groundwater..." GRACE is not so capable at measuring the absolute amount of groundwater present in a basin as it is at suggesting changes in storage over time.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 7619, 2013.