

## ***Interactive comment on “Sensitivity of simulated global-scale freshwater fluxes and storages to input data, hydrological model structure, human water use and calibration” by H. Müller Schmied et al.***

### **Anonymous Referee #1**

Received and published: 23 March 2014

#### General Remarks:

This manuscript uses the global water resources assessment model WaterGAP to conduct a series of experiments by changing meteorological forcing and land use data, model physics, parameters, and processes involved with human water use. Results from these experiments are compared with those from the standard version of the model to study the sensitivity of simulated water fluxes and stores to the variations made in the experiments. The study concludes that the basin-specific calibration leads

C616

to the largest change among different variants considered, with the changes in climate forcing to be the second dominant factor. While the results are interesting and suitable for HESS, I find that there are important shortcomings in the presentation of this study which should be addressed before acceptance for publication. Some of the issues are related to limited discussion of the possible reasons behind the differences in hydrologic components simulated by different model variants. The introduction and several other sections can be significantly refined with additional efforts. I summarize my specific comments in the followings.

#### Specific Comments:

P1589,L11: “Parameter uncertainty is neglected”. What is its significance here? Please clarify.

P1591,L19: Wouldn't the sudden change in input forcing cause abrupt changes in storages and fluxes in the model? I assume that the model would show certain spurious trends in states and fluxes until it reaches a new equilibrium in the new climate. Please discuss this issue here.

P1594,L8: “. . .entirely satisfied from surface water resources. . .”. How is the demand satisfied if surface water supplies are not enough?

P1595,L11: Why is ET less when water use is considered? I would assume that ET increases due to irrigation. Also, soil water storage should increase if water is taken from rivers and is used for irrigation.

P1595 L17: Is it 1031 or it is because of roundup? You may note in Table captions that the numbers don't sum up due to rounding.

P1596, L16: “without passing the soil compartment”: Where does the groundwater go if it is used for irrigation? Isn't it added to the soil?

P1596, L20: How do you attribute the difference in ET from WFD and WFDEI? High ET could be related to higher temperatures but how do precipitation differ in two datasets?

C617

P1597 and Fig 3: Significant spatial differences can be seen in Figure 3. More detailed explanation on the reasons would be appreciated. For example, why is ET so high around the great lakes in STRUCTURE-STANDARD? Likewise, what causes the huge blue blob in eastern China in NoCal-STANDARD?

Figure 4: Why is NoUse missing in Figure 4? Adding it would make Figure 3 and 4 identical and that makes it easy to follow.

Figure 4: Why is there a red blob in northwest India in the difference between in landcover-standard (c)? Specifically, why does land cover affect so hugely in some regions?

P1599,L21: It would be interesting to see NoCal in Fig. 5 if the limits are not way too off.

Figure 5: I wonder why STRUCTURE does a very good job in Lena. Conversely, why does it show mediocre performance in Parana? Please discuss in more details.

Figure 5: Please make the legends bigger.

P1600, L1-L11: Please add more discussion on the varied response to different factors in different regions.

P1601, Figure 7: It is not clear what the variable shown in 7(a) is? Is it the difference between the minima and maxima of the seasonal cycle of TWS? Please explain in the text.

P1602, L17-L26: Please consider revising some sentences to improve readability.

P1604, L25: Why changes in ET and runoff compensate each other, given that the total input precipitation could be different? Does it mean that storage change is huge?

P1605,L17: In figure 5 why don't we see any improvements in the Mackenzie as in Danube caused by the difference in snow melt timing? In general, please provide more detailed discussions.

C618

P1606,L20: Again, as I also noted earlier why does ET reduce when water use is considered?

P1606, L22: It is not clear why ET from irrigated crops is not considered in AET? Please explain this clearly in the manuscript here and elsewhere. Table 2: P for CLIMATE: Is it possible to show the averages for WFD and WFDEI in the footnote.

Table 3: soil for STANDARD and NoUse: Why are they same? It is not clear where the irrigation water goes as it never affects soil water. Please clarify.

Column 1 (STANDARD): Is water consumption limited to the availability from surface water only? What is the -72 groundwater use? Is it return to groundwater from surface water use? Please clarify.

Editorial Issues (I list some editorial issues below but the list may not be exhaustive. Please carefully proofread the manuscript before submission.)

P1586:

L4: add "to" after "due"

L7: change "sum" to "total"

L15 onwards: The first paragraph of introduction looks a little patchy. Please consider re-writing/re-structuring the whole section.

L20: delete "a"

L25: change 'it' to "they"

L26: It is not clear what it means by "estimation of groundwater recharge is equivalent to ...". Please clarify.

Page 1587:

L5: "strategies" to "methods/ways"

C619

L6: "on the other hand" looks abrupt and awkward. Please re-phrase  
L13: change "equations" to "schemes" or something alike  
L20: change "yr" to "years"  
L27: I suggest re-phrasing  
P1588:  
L10: ",while..." is not clear  
L13: please revise this sentence  
L13: change "of" to "in"  
LL14: "simulations of" should be "simulated by"  
P1590,L18: change "done" to "made"  
P1591,L27: "(" is missing.  
P1596, L3: it should be "(RWR)"  
P1598, L21: "RWR" is already defined.  
P1602,L20: "currently available"  
P1603, section 4.2: You may want to use "advantages" or alike instead of "benefits".  
P1603,L16: Re-phrasing required. It should be "ET is largely reduced in one half of the basin..."  
P1605, L13: This sentence is difficult to comprehend  
P1608,L14: delete "well"  
P1609,L19: "but also" please revise this sentence.  
P1609, L27: please replace "weak" by a better term.

C620

P1615,L5: please add "," before "which".  
Table 1: "Like STANDARD": change to "Similar to STANDARD"  
Table 1: change "land cover of the ..." to "land cover for the ..."

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 1583, 2014.

C621