

## ***Interactive comment on “Virtual water trade and development in Africa” by M. Konar and K. Caylor***

**Anonymous Referee #2**

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This paper presents several interesting findings related to virtual water trade in Africa, e.g. the infrastructure sharing across nations, and the positive contribution of virtual water trade to human welfare. However, I also have several concerns on the data inconsistency, statistical analysis, and the presentation of many methods in the “Results and discussion” section. I suggest publishing the paper after major revision. The general comments are show below:

(1) In the “Results and discussion” section, the authors describe detailed methods for the assessments. All the method description should be moved to the “Methods” section, and should not stay in the “Results and discussion” section. This comment applies to Section 3.1-3.4.

(2) There is a lack of consistence in the data sources used in the paper. First, the author use yearly VWC information from the H08 model for 1986-2001, but from calculation

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based on Eq. 1 for 2002-2008. Here it is suggested that the author should use a consistent method e.g. all calculations are based on the H08 model. The reason is that ET fluctuates from year to year. If you only use ET in 2001 for the calculation (Eq. 1), large errors will occur for the VWC during 2002-2008. Second, for Eq. 6, VWE and VWI is calculated mainly based on the H08 model and trade data on an annual basis, but ETc is from Hoekstra and Chapagain (2008), who provide the average data for a certain period. Hence, VWE/VWI and ETc are used not consistently in terms of the temporal scale. It is strongly suggested that authors use consistent data in terms of time, and data sources. Otherwise, the analysis is not convincing.

(3) For many Figures, e.g. Fig. 2, Fig. 3, Fig. 4, Fig. 6, the R2 and significance level are expected. In addition, for Fig. 5, statistical analysis is needed to show how significant is the external water consumption in small dam capacity group higher than that in large dam capacity group.

(4) There are a lot of repetitions when the figures are explained. For example, authors describe red horizontal line, red star etc in detail in the Figure Legend. Then the description is repeated in text (i.e. Page 7305, Line 17-21). Repetition should be avoided if possible. This comment applies to other graphs in the manuscript.

(5) The authors point out outliers. For example, Mauritius and Botswana are outliers for small dam storage capacity group. An in-depth analysis is expected to know why they stand out to be outliers. This comment also applies to other places in the paper.

(6) There are many places where authors use “African trade”. Do you mean the internal African trade, or the total trade that also includes international trade with other continent? For example, Page 7308, Line 5-6, the authors mention “Internal African savings are 2.5 times higher than total African trade”. Another example is Page 7301, Line 1-2: “internal African trade is larger than African trade with the ROW”? (7) Page 7294, Line 8-14: Two comments here. First, a citation is needed for the IPCC report. Second, there have been several doubts to the findings for the impacts of climate change on

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agricultural yield in Africa from IPCC(e.g. decrease by 50%). It is argued that IPCC report does not provide sufficient evidence or literature support for such findings. In a recent article, Liu et al., 2013 found that due to climate change, crop yield in Africa will first increase in the near future, but decrease in the far future. It is suggested that authors should not only cite the IPCC report results but also cite new findings in recent literature here. Reference: Liu J., Folberth C., Yang H., Röckström J., Abbaspour K., et al. (2013) A Global and Spatially Explicit Assessment of Climate Change Impacts on Crop Production and Consumptive Water Use. PLoS ONE 8 (2): e57750.

Specific comments:

Page 7293, Line 26: The article below reviews China's water availability and water scarcity, and could be cited here: Liu J., Zang C., Tian S., Liu J., Yang H., Jia S., You L., Liu B., Zhang M., 2013. Water conservancy projects in China: achievements, challenges and way forward. Global Environmental Change 23 (3): 633-643.

Page 7294, Line 1: Typo error. Change :FAO, 2009) to (FAO, 2009)

Page 7297, Line 9-10: It is not clear how the VWC of livestock products is calculated. Please clarify!

Page 7298, Line 8-10: how representative are the 50 commodities for Africa?

Page 7302, Line 12-13 "future values of VWI and future values of the variables of interest", did you use future values of VWI in this paper?

Page 7303, Line 9, "in the literature", which literature?

Page 7306, Line 14: "thos"?

Figure 7: The could names (probably the most important countries) should be marked in A and B.

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