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Hydrology and Earth System Sciences Discussions

Interactive comment on "Local and global perspectives on the virtual water trade" *by* S. Tamea et al.

Anonymous Referee #1

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This manuscript aims to contribute to the rapidly growing body of literature on virtual water network by focusing on a local, i.e., country, scale and examining it in the global context. The authors propose to visualize the import and export trades as river networks and deltas, respectively. They also investigate the temporal trends of distance travelled by virtual water, both overall and by category of goods.

The paper is well-written and addresses the topic that I believe should be of interest of HESS's readership. The methods are clearly explained. The figures are appropriate and helpful in understanding their results (but see comments below).

That said, I have a few reservations about this manuscript, most of which have to do with clarification of some results and more effective emphasis on the novel contribu-

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Interactive Discussion
Discussion Paper

tions it makes in the context of existing literature. These should be addressed before the manuscript is considered for publication. In all the comments below, if I am mistaken and misunderstand anything, the authors are encouraged to simply tell me so (i.e., no need for sugarcoating).

RIVER NETWORKS AND RIVER DELTAS OF VIRTUAL WATER. While I think that the river networks and river deltas are aesthetically pleasing (which I really like) and potentially useful GRAPHICAL representations of virtual water trades, they are NOT appropriate NETWORK representations of them. My understanding of the trade data analyzed is that these are trades DIRECTLY made between pairs of countries. Therefore, the network representation of such a trade network would be one where there is a direct link between exporting and importing countries (e.g., Fig 2 in Konar et al., WRR 2011). Admittedly, such a network would be messy and cluttered, and I am guessing that this was one of the motivations for the authors to come up with a new visualization scheme.

This is all fine, but it must be explained and emphasized more explicitly as to avoid misleading the casual reader of the manuscript. In a network analysis, a node represents connectivity: in an actual river network, a node or confluence means accumulation of water; in an actual delta, it means distribution of water. However, here, a node is arbitrary and simply selected for good visualization, but does not capture any actual accumulation or distribution of the virtual water (e.g., virtual water from Canada does not actually combine with that from the US before reaching Italy).

VIRTUAL WATER BALANCE (SECTION 3.2). Part of this analysis is based on ranking of the volumes of virtual water in trade. I believe that such ranking, or something very similar, has been conducted somewhere in the existing literature. If so, there should be more relevant references cited, and the authors should highlight what are the new insights they find compared to what has already been done.

DISTANCE-BASED ANALYSES. To my knowledge, this section is quite novel and

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should be emphasized more. For one thing, it opens the possibility of linking virtual water to energy consumption required to transport it, which would then allow for an even more comprehensive analysis of the effects of trade on the environment. I believe there is a trend among a number of scientists to move toward such analyses, and the authors' analysis could contribute to that development. This is something the authors may wish to include in their discussion, as it broadens the impacts of their work.

Some additional specific comments:

P12962, 1st par: Regarding the exponential distributions of the node degrees, please note that while Konar et al. (WRR 2011) reported that they follow exponential distributions, a more recent work by Shutters and Muneepeerakul (PLoS ONE, 2012) questioned this claim.

P12962, 2nd par: "previous country-based works"...it would be good to provide some references of these works.

P12963, Methods: Brief definitions of grey, blue, and green waters would be helpful for the reader who is not familiar with these terms.

P12972, L23: "..., being luxury and plants the most important..." should perhaps be "...,with luxury items and plants being the most important..."

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 12959, 2012.