

## ***Interactive comment on “Dryland ecohydrology and climate change: critical issues and technical advances” by L. Wang et al.***

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Review of HESSD-9-4777-2012 L. Wang et al. Dryland ecohydrology and climate change: critical issues and technical advances

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Part 1: Reviewed prior to reading comments from other reviewers

General Comments In this paper, the authors present a set of critical issues and technical advances related to the water resources, hydrology, and ecohydrology of drylands. The manuscript presents a thoughtful review of some key issues and questions and raises some compelling challenges. The paper also provides a nice review of two

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categories of recent advances: remote sensing and the use of stable isotopes.

The paper is well written and organized and covers a number of engaging topics. At the same time, the paper is a bit lacking in its coherence and comprehensiveness, and I offer a few suggestions for improvement.

The manuscript begins with the articulation of seven “critical issues” – some topical (such as woody plant encroachment and population growth) and some tied to scale (such as what is our understanding of hydrology at the plot and regional scales). This list may not be exhaustive, but it presents a range of challenging issues for consideration.

The paper then continues to articulate three technical advances. The selection/organization of these advances is a bit unclear. Are they presented to address the aforementioned critical issues? Or presented more generally?

For example, the use of NDVI and RESTREND to separate the effects of climate change and human-induced land degradation relates directly to critical issue #4 (human versus climate-induced desertification). And, remote sensing of the hydrologic cycle (technical advance #2) could be related to regional hydrology (critical issue #7). The use of isotopes to partition ET into E and T seems to be solving a problem not presented as a critical issue. Is this included primarily because of the authors’ familiarity with these techniques? I recommend that a more explicit connection be made between this technical advance and the critical issues (perhaps plot-scale hydrology).

And what of technical advances not included? On par with the development of isotope techniques has been the development of distributed-temperature sensing (DTS). This fiber-optic instrument offers great opportunity to provide high-resolution data on field-scale hydrology – perhaps potentially addressing the critical issue of the plot-scale spatial distribution of infiltration. Why is this not included? And why not other measurement advances (e.g., strain gauges to measure interception, sap flux to determine transpiration)? And what of modeling and representational advances? This, of course,

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opens a whole other can of worms – perhaps the focus is on measurement advances (rather than technical advances). In any case, some explanation for why certain advances are included or not seems appropriate and would enhance the paper.

Also, what of the critical issues that are not addressed by the technical advances mentioned in the paper? As written, the paper ends rather abruptly after the presentation of the technical advances. Even if the solutions are not yet present, perhaps the authors could provide their thoughts on what might be needed to address the issues of population growth and water demands or development. Are the issues technical? Social? Economic? What is the role of the hydrologist? Can the hydrologist make a contribution to those critical issues? Since the authors take the time to present the issues, I recommend that they offer some thoughts on pathways forward.

Overall, I enjoyed reading this thought-provoking paper. I think it can be improved with a clearer rationale for the technical advances included (and perhaps an expansion of that section) and a concluding section that returns to the seven critical issues and offers some commentary on how the hydrologic community can contribute to each.

Part 2: Additional thoughts after reading comments from Reviewer 1 and 2

I generally concur with the comments of the two prior reviewers. I think the issues of scale and scaling are indeed “critical.” Perhaps it is worth including some of the “technical advances” in this area? That is, new insights into how to represent the same processes at different time and space scales? That may lead the paper too far afield, however.

I will echo my colleagues in their general support of the paper, and (as outlined above), I think it can be improved with some reorganization and clarification.

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