

## ***Interactive comment on “Groundwater-dependent ecosystems: recent insights, new techniques and an ecosystem-scale threshold response” by D. Eamus et al.***

### **Anonymous Referee #1**

Received and published: 27 May 2015

The Authors presents a review on groundwater dependent ecosystems (GDEs) with the focus on the definition of their location, the quantification of their groundwater (GW) use, and their response to GW extraction.

Although the review is in general well written and likely to be of interest to the readers of HESS, I have few issues that I would suggest the Authors to consider, as listed in the following points.

- The review is excessively long and touches on many topics that have been already reviewed in the recent literature. Recent review papers on GDEs are: Naumburg et

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al. (Environ. Manage., 35(6), 726–740, 2005), Lubczynski (Hydrogeol. J., 17(1), 247–259, 2009), Klove, B., et al. (Environ. Sci. Policy, 14(7), 770–781 and 782–793, 2011), and Orellana et al. (Rev. Geophys., 50, RG3003, 2012). I think the Authors should put their work in the context of what is already available in the literature and focus on what is currently missing from these existing review papers.

- Some sections of the paper are largely available in the existing literature and do not need to be repeated. For example, section 2 could be considerably shortened if not removed completely. Likewise, the parts on groundwater fluctuations and isotopes have been extensively reviewed in other recent papers. The case studies are disconnected from the other sections of the review; I would consider to remove them.

It seems to me that the new topics addressed here are the use of remote sensing (RS) technologies in GDE studies and the response to GW levels. Maybe, the Authors could focus their review on these issues.

- Accordingly to the points above, I would suggest to re-organize the review as:

1. Introduction: contextualize the review and focus on RS and ecosystem response to GW levels.
2. Identify GDEs: I would just present the sections on RS and maybe touch briefly on GW fluctuations and isotopes.
3. A primer on remote sensing...: I would include here current sections 4 and 5. I think the section on GRACE, which is a RS technology as well, should be here.
4. Current section 8
5. Current section 9
6. Conclusions

SPECIFIC COMMENTS: - P4678, L6; ...GDEs, and (3)...

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- P4691, L14: ...water table results...
- P4695, L7-8: it seems to me that these two paragraphs are disconnected. There is a logic jump.
- P4695, L16: ...applications, downscaling...
- P4697, L22: Fig 2 should be Fig. 3. The references to figure numbers is not correct throughout the manuscript.
- Section 6.3: as far as I know, MODFLOW models GW flow; the modeling of flow in the unsaturated zone is very simplified and does not use the Richards equation. I also believe that Ajami et al. (2011 and 2012) did not model the unsaturated zone, but included direct root water uptake from GW in MODFLOW.
- P4704, L22 25: what are 'end-member analyses'?
- P4708, L16-17: I would not say that ET rates exceeded radiation. I would use the term latent heat in relation to radiation.
- Table 5: I would not use a table to explain terms in a figure. I would include this table in the figure or figure caption.
- Figs. 3, 4, and 5: I would remove these figures; they are not very informative.
- Fig. 8: this figure carries a lot of information and is very difficult to understand. What is the meaning of the different types of arrows?
- Fig. 9: what is the variable on the vertical axis? I understand that this figure is from a PhD thesis and the Authors might want to keep details for other publications; however, it is very difficult to understand what this figure refers to. Further, I would not fit a curve across the points. Any curve that goes from about 0.9 to about 0.7 when GW is around 9 m would fit the data well; as such, there is no point to fit a curve and report the  $R^2$ . I would rather show the experimental points and have a vertical line or a colored vertical bar when GW is between 8-10 to show that there is a threshold effect. The

Authors might also want to link these results to the work by Benyon and Doody (2004) on plantations, where the suggested value of GW level for possible root water uptake was above 6 m.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 4677, 2015.

**HESD**

12, C1769–C1772, 2015

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