

Interactive comment on “Water-use dynamics of a peat swamp forest and a dune forest in Maputaland, South Africa” by A. D. Clulow et al.

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The following text is a copy of the the previous supplement(C155) as requested. Unfortunately bold fonts are not shown and nor are the corrected graphs.

Dr. Mark Gush is thanked for his thorough review. His comments and suggestions were insightful and have contributed significantly to the content of the paper.

The paper would benefit from an indication by the authors of practical ways of using, or scaling up, the measurements described here for the purposes of water balance calculations, or water resource assessments in this important conservation area. The challenge of scaling up the measurements is mentioned in the conclusions, but this statement requires some elaboration in terms of what specific measurements and

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modelling would be required to improve understanding of the general hydrology of the area.

To address the opening comment above, we have split the paragraph on pg 1748, lines 14-26 and added information to the first paragraph: The diversity of the vegetation and irregular spacing of the trees within the forests adds complexity to the possibility of up scaling the individual tree water-use to forest community water-use. It would be necessary to understand the relationships between tree water-use and tree height, stem diameter or canopy area to investigate the reliability of up scaling single tree water use. However this still ignores soil evaporation and undergrowth water-use and in terms of understanding the wider catchment hydrology it would therefore be beneficial to derive the ET of the PSF and DF using eddy covariance or scintillometry where appropriate. Analysis similar to those presented in this research, but with ET in place of individual tree water-use (Figs 10 and 11), would provide a useful indication of how effectively ET of the PSF and DF could be estimated from simple meteorological and soil water data. These ET results would provide the ET information typically used at catchment scales in hydrological modelling studies.

Within the DF in particular, the results presented were from a site at the dune crest. Water-use may be different on lower slopes where the roots have access to groundwater. In addition, the orientation of the dunes along the coast results in east and west facing aspects. The DF trees facing the sea on the east are exposed to salt spray which may affect the process of transpiration (Sykes and Wilson, 1988; Robertson et al., 1998). According to Pooley (2003), the high winds and salt spray limit growth (and therefore water-use) in the Maputaland DF's. Further research to investigate the occurrence of DF areas that potentially use groundwater on the lower slopes and the influence of slope position on transpiration would be beneficial particularly in terms of up scaling the water-use of the DF from individual tree water-use results.

Page 1727, line 8: Use “introduced” as opposed to “alien”.

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Corrected

Page 1727, line 23: Suggest replacing “blamed” with “associated with”.

Corrected

Page 1727, lines 22-25: I suggest clarifying this point by mentioning that “the cause of the water balance change was largely attributed to the fact that deep-rooted, evergreen, high leaf area, aerodynamically rough forest plantations replaced shallow rooted, seasonally dormant, grasslands.”

Corrected, much better now. Thank you.

Page 1728, line 5: References required e.g. “.....cost associated with forestry (DWAF, 2004), and strict environmental legislation associated with riparian zones have been implemented (FIEC, 2005)”. Suggested references are:

DWAF. 2004. Stream Flow Reduction Allocations: History. Department of Water Affairs and Forestry, Pretoria, South Africa. Available from: <http://www.dwaf.gov.za/sfra/sfra_lic_history.asp> [Last Update Used: 18 March 2004].

FIEC 1995. Guidelines for environmental conservation management in commercial forests in South Africa. Forestry Industry Environmental Committee, Forest Owners Association, Johannesburg.

Corrected. Thank you for the relevant references.

Page 1731, line 26: It is possible to include a Table or figure of LAI fluctuations for the two sites?

Graph of LAI included:

Page 1732, line 7: Remove “monitored” from the sentence.

Corrected.

Page 1733, line 13: Add:.....to distinguish between sapwood and heartwood replacing

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“blamed” with “associated with”.

Corrected.

Page 1733, line 24: Add “TC” between the words “four” and “pairs”.

Corrected.

Page 1734, line 15: Add:.....”below any branches.” Corrected. Page 1735, line 5: Remove the “,” at the end of the sentence.

Corrected.

Page 1736, line 18: Is this the best way to represent the proportions of roots at different depths and between different sites? By using a % dried root mass per dried soil mass, you are not accounting for differences in soil density between the two sites. This makes it difficult to assess how root densities varied between sites, unless the soils had very similar densities. Would it not be more appropriate to state what the dried root mass was relative to the soil volume sampled?

Good point. We used the bulk density to convert the existing results as suggested and replaced the existing graph with the one below:

Page 1736, line 21: Change to: “2009/2010 hydrological year” between the words “four” and “pairs”.

We were unable to find this location in the document with the words described above but have assumed the following change was referred to:

The annual precipitation measured over the 2010 hydrological year (October to September) was 650 mm, well below the long-term average of 1200 mm yr⁻¹.

Was changed to:

The annual precipitation measured over the 2009/2010 hydrological year (October 2009 to September 2010) was 650 mm, well below the long-term average of 1200

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mm yr⁻¹.

Page 1740, line 14: Could the decreasing water use of the *Syzigium* during the 2010/2011 season (relative to the 2009/2010 season) possibly be attributed to progressive increases in the wound widths associated with the sap flow and heater probes, and the resultant reduction in heat dissipation / detection by the TCs? Were any periodic observations on wound widths made, or just an assessment at the end of the study?

A valid comment and one that occurred to us during the analysis of the data. We didn't monitor wounding during the observations but did the assessment at the end of the study. There no evidence that we are aware of at present that wounding is progressive. In Green et al. (2003) they state that most of the wounding changes occur within the first two weeks after drilling when the tree is presumably responding to the vessel damage.

The subject of progressive wounding is certainly one that should be researched further but based on current knowledge and wounding correction procedures, not something we felt we could hypothesise over.

A study in which drilling is performed and heaters and TC's installed and run normally with monthly monitoring of wounding would be a useful topic of future research.

Page 1744, line 21: The reference (Bulcock and Jewitt, 2012) does not appear in the reference list. Check that all references cited in the text appear in the reference list.

Corrected and all references checked.

Page 1746, line 25: Change "daily" to "day".

Corrected.

Page 1746, line 28: Change "resulting" to "resulted".

Corrected.

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Page 1751, lines 25 and page 1731, line 1: A more appropriate citation for Geldenhuys (2010) would be: von Maltitz et al., (2003) and Mucina and Rutherford (2006): Reference is: von Maltitz, G., Mucina, L., Geldenhuys, C.J., Lawes, M.J., Eeley, H., Aidie, H., Vink, D., Fleming, G. & Bailey, C. 2003. Classification system for South African Indigenous Forests. An objective classification for the Department of Water Affairs and Forestry Unpublished report, No. ENV-P-C 2003-017, Environmentek, CSIR, Pretoria. 275 pp.

Corrected. Thank you for the suggested reference.

Page 1752, lines 12-20: More appropriate citations for these references would be the following: Gush, M.B. and Dye, P.J., 2006. Water use measurements of selected woodland tree species within the Kruger National Park. In: Proceedings of the 4th Natural Forests and Savanna Woodlands Symposium, Port Elizabeth, 15 – 18 May. pp 387. Gush, M.B. and Dye, P.J. 2009. Water-use efficiency within a selection of indigenous and exotic tree species in South Africa as determined using sap flow and biomass measurements. *Acta Hort. (ISHS)*, 846: 323-330. Gush, M.B., Scott, D.F., Jewitt, G.P.W., Schulze, R.E., Lumsden, T.G., Hallowes, L.A. and Görgens, A.H.M., 2002. Estimation of streamflow reductions resulting from commercial afforestation in South Africa. Water Research Commission Report No. TT173/02. South African Weather Services: Temperature and precipitation data, Pretoria, South Africa, 2004. (website??) Corrected. Thank you for the suggested references.

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