

Interactive comment on “Field data collection and analysis of canopy and litter interception in commercial forest plantations in the KwaZulu-Natal Midlands, South Africa” by H. H. Bulcock and G. P. W. Jewitt

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Thank you for your very useful and constructive comments.

Anonymous Referee #1

Referee: Sect 2.2: How is a weather station 'programmed to measure reference evaporation'?

Response: Corrected: A Campbell Scientific CR10x logger at the automatic weather
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station which measures all the parameters required to calculate Penman-Monteith reference evaporation was programmed to calculate the reference evaporation. It was situated approximately 1.7 km from the P. patula site in an open kikuyu grassland.

Referee: Sect 2.2: Reference is made to rainfall events throughout the paper, but it is not clear whether these are continuous events over different time periods or whether these are really daily events. This can make a big difference in the interpretation of the results as daily rainfall total could consist of short rainfall periods with plenty of time for evaporation.

Response: Corrected: In this study, rainfall events are defined as discrete events separated by period of greater than one hour.

Referee: I would suggest that Figs 5 and 6 are presented in the wrong order. Fig 6 is required to be able to provide an initial estimate of the storage capacity, which is used in Fig. 5 and Table 3. This also means that the discussion of the results should be moved around in section 3.1 and this will avoid phrases like 'Canopy storage capacity will be discussed in more detail later'.

Response: Corrected: The order of Figures 5 and 6 has been changed around, as well as the discussion of the figures accordingly.

Referee: The sentence on page 11 L15-16 needs more explanation or needs to be presented in a clearer way.

Response: Corrected: "Although the log function may not fit the data very well, it does illustrate the fact that there is still wet canopy evaporation after the storage capacity of the canopy has been reached due to the fact that evaporation continues during the event. Thus, the longer the event lasts, the more wet canopy evaporation will occur and therefore, the line fitted to the data does not 'flatten' completely"

Referee: P12, l6-8: this sentence is not clear and should be re-phrased.

Response: Corrected: The maximum amount of gross precipitation to be totally inter-

cepted by the canopy before throughfall takes place is the canopy storage capacity, as illustrated by the broken red line in Fig. 6a, b and c. (P.S. now Fig. 5a, b and c)

Referee: Fig.2 Indicate what 'events' really means (see earlier comment).

Response: Corrected: See earlier response.

Referee: The regression lines do not seem to fit the data very well. What about using a different non-linear function.

Response: Other non-linear functions were applied, but due to the large scatter in the data (particularly Fig5b), no function fitted any better than the log function that was finally used. The r^2 values of 0.72, 0.65 and 0.77 are considered acceptable.

Referee: Fig. 9 I would have thought that stacked bars would represent the data in a much clearer way.

Response: Not Corrected: Two "stack bar" graph options were investigated. The problem with the one stack graph option is that they make each bar add up to 100% (i.e. normalize) and you therefore lose important detail such as seasonality and magnitude. For example, if in one month there is 100mm of rain, and 25mm is canopy interception, the graph will look the same as if there is 4mm of rain and 1mm is canopy interception. The second option literally stacks each component and it is difficult to make out each component as the y-axis represents a total of all components and this value is not all that useful. Secondly, during the summer months where there is lots of rainfall, the sum of all the contribution (i.e. gross precipitation + Canopy Interception + Litter interception + Water that drains to the soil) becomes very large. Conversely, during the winter months when there is little rainfall, the stack is very small, and the "relative contributions" of each component are not clear. Therefore, we have decided that the graphs used are the best (although we agree they are not that easy to read). We will request that they are made bigger in the final typeset.

Referee: P2, L10: Refer to 'characteristics of rainfall'

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Response: Corrected: Changed "features of rainfall" to "characteristics of rainfall".

Referee: P2, L11: Llorens et al. is 2007 in the text but 1997 in the reference list.

Response: Corrected: Should be 1997.

Referee: P3, L12: should be Dye and Versfeld, 1992.

Response: Corrected:

Referee: P3, L13: Langford and O'Shaughnessy is not referenced.

Response: Corrected:Reference added: Langford, K.J. and O'Shaughnessy, P.J. A study of canopy interception in native forests and conifer plantations.Melbourne and Metropolitan Board of Works, Australia, Report No., MMBW-W-0007.88. 1978.

Referee: P6, L28: I don't think you should refer to 'linear' variability of throughfall. The word linear could have different meanings. Perhaps 'radial' would be better.

Response: Corrected: The word 'linear' has been changed to 'radial'

Referee: P7, L18-20: This sentence needs some attention as it is not correct grammar.

Response: Corrected: They found that a correction factor based on the shoot morphology can be applied. This can be independently measured, and appears to adequately compensate for this.

Referee: P8, L19: Schaap and Bouten (not et al.)

Response: Corrected: changed from Schaap et al. to Schaap and Bouten.

Referee: P8, L25: Helvey and Patric (1965) not referenced.

Response: Corrected: Reference added: Helvey, J.D. and Patric, J.H.: Canopy and litter interception of rainfall by hardwoods of the eastern United States. Water Resour.Res., 1, 193-206, 1965.

Referee: P9, L1: should be fig. 4

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Response: Corrected: change to Fig. 4.

Referee: P9, L8: '..sensitive to temperature which Gerrits (2010) attempted to correct by using a ... to compensate for the influence of temperature'.

Response: Corrected: The main source of error was due to the strain gauges being sensitive to temperature which Gerrits (2010) attempted to correct by using a so called "dummy sensor" to compensate for the influence of temperature.

Referee: P9, L27-28: add the 'illustrated by the arrows' in parenthesis to the end of the previous sentence and delete 'showing ...has been reached'.

Response: Corrected: "... there is still wet canopy evaporation after the storage capacity of the canopy has been reached due to the fact that evaporation continues during the event, as illustrated by the arrows."

Referee: P10, L4-6: It is not necessary to repeat the values presented in a table within the text - this whole sentence can be removed. See also L8-10 on page 12; L6-8 on page 13.

Response: Corrected: deleted the following sentences: P10, L4-6.: "From Table 3 it can be seen that *A. mearnsii* has the highest canopy interception loss over the study period, followed by *P. patula* and *E. grandis* respectively. *Acacia mearnsii* intercepted 27.7% of the gross precipitation, and *P. patula* and *E. grandis* intercepted 21.4% and 14.9% respectively".

P12, L8-10.: As shown in Table 5, for the two contrasting time periods of February 2009 and 2010 where in February 2009 there was 216.4 mm of rainfall in comparison to February 2010 when there was almost five times less rainfall at 43.0 mm."

P13, L6-8.: "From Table 6 it can be seen that during the period April 2008 to March 2011 the *P. patula* litter intercepted 231.2mm (12.1%) of gross precipitation, while *E. grandis* and *A. mearnsii* intercepted 160.4mm (8.5%) and 124.7mm (6.6%) of gross precipitation respectively."

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Referee: P11, L26: add the short 1 sentence paragraph to the previous one.

Response: Corrected

Referee: Helvey (1964) is not referenced.

Response: Corrected: Reference added: Helvey, J.D.: Rainfall interception by hardwood forest litter in the southern Appalachians. U.S. Forest Services Research Paper SE 8, 1-8, 1964.

Referee: P14, L18-20: This is a trivial statement and should be changed or removed; it does not add to the discussion.

Response: Corrected: sentence removed:

Referee: P15 reference to Figs 14 to 16 and Fig 13 should be corrected.

Response: Corrected: Fig 14 to 16 changed to Fig. 8a, b and c. Fig 13 changed to Fig 7.

Referee: Dye and Versfeld / Everson et al. are out of order.

Response: Corrected: order changed.

Referee: Versfeld (1987) is an incomplete reference - refer to the correct conference name.

Response: Corrected: Versfeld, D.B.: Predictive models for rainfall interception – measurements in *Pinus radiata* and *Protea neriifolia*. South African National Committee of the International Association of Hydrological Sciences Symposium, Grahamstown, South Africa. 1987.

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