

## ***Interactive comment on* “Predicting effects of plantation expansion on streamflow regime for catchments in Australia” by L. Zhang et al.**

### **Anonymous Referee #1**

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The likely effects of plantation expansion on streamflows in Australia is a current topic of interest to hydrologists, water resources managers and forest management agencies. Predicting the effects accurately is imperative and the authors in this paper have expanded on their work published in various other locations (e.g. Zhang et al., 2001; Brown et al., 2005; Zhao et al., 2010) largely by applying and testing the FCFC model in larger catchments.

In general the paper is informative and well-written. I do, however, have some comments:

1. Prior land use. There is no mention in the paper of the land use prior to afforestation. The reader unfamiliar with Australian forestry may well assume that the prior land use was grass or pasture. However, this is not always the case. Until the 1980s much of

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the pine plantation estate in Australia was established by the clearing of native eucalypt forest, i.e. a eucalypt to pine conversion (cf a grass to pine conversion). Examples verifying this include the Croppers Creek project in Victoria (Bren & Hopmans, 2007) and the Lidsdale project in New South Wales (Putuhena & Cordery, 2000):

Bren, L.J. & Hopmans, P. (2007). Paired catchments observations on the water yield of mature eucalypt and immature radiata pine plantations in Victoria, Australia. *Journal of Hydrology*, 336: 416-429.

Putuhena, W.M. & Cordery, I. (2000). Some hydrological effects of changing forest cover from eucalypts to *Pinus radiata*. *Agricultural and Forest Meteorology*, 100: 59-72.

This information is critical for the analysis and discussion of results. Figure 4 shows cumulative plantation cover in the Adjungbilly Ck catchment, but given that the bulk of the expansion occurred in the 1960s and 1970s, was this eucalypt conversion or grass conversion? If it was wholly or partially eucalypt conversion, does this invalidate the results presented? Some further information and/or comment is warranted here.

2. Effects of plantation age and other factors. Some discussion of this needs to be added. Use of the FCFC model appears not to account for the "life cycle" of a plantation, with water use changing with forest age and thinning, for example. One of the catchments used (Red Hill) formed part of a paired catchment study that evaluated the effects of age and thinning on streamflow. The authors should refer to this work:

Webb, A.A. & Kathuria, A. (2012). Response of streamflow to afforestation and thinning at Red Hill, Murray Darling Basin, Australia. *Journal of Hydrology*, 412-413: 133-140.

Acknowledging that FCFC compares long-term means, one assumes, however, that there is a lag in FDC changes due to afforestation. Was it evident in any of the datasets? Some comment on this issue should be included. Was drought a factor given that post-planting in southern Australia has probably been drier than pre-planting?

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3. Comparison between predicted and observed FDCs. The authors state (p388) that "all the catchments showed good agreement between the predictions and observations, except for one or two other catchments". While this is supported by the coefficient of efficiency  $>0.8$  there appear to be more than "one or two" exceptions. Upon inspection of Figure 7, the FCFC model appears to have performed least well in Bombala River (~27% plantation), Crawford River (24%), Darlot Ck (13%), Eumeralla River (20%), Red Hill (78%), Traralgon Ck (58%). Bombala R and Traralgon Ck do not seem to match up well at all and it would be useful for the authors to explain more explicitly where and why the predictions were more or less accurate. The inaccuracies do not seem correlated with catchment area or % plantation so what do the authors think is the cause?

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