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Hydrology and Earth System Sciences Discussions

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

**Anonymous Referee #2**

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In the paper, effects of plantation expansion on streamflows in Australia were analysed using the simple FCFC model, which was applied in 15 catchments with areas ranging from 0.6 up to 1135.7 km2. This model needs only a low amount of easy available data such as measured daily stream flow, daily mean rainfall and potential evapotranspiration as input. The results might be of interest to e.g. water resources managers and forest management agencies. The paper focuses on a very interesting topic and has an appropriate scientific basis. However, from my point of view, the paper is sometimes difficult to read as a standalone publication in the actual state and should be restructured especially in the model chapter. For many relevant informations about the model and data preprocessing, the authors refer to publications without any further or only insufficient description and explanation. Further comments will go more into details.



Chapter 2. Model description Obviously, the FCFC model consists of three parts such as the parameterization of the FDC-curve, calculation of mean annual water yield, and a simple bucket model to calculate the percentage of time the flow occurs in a given catchment. In the recent paper, only the parameterization of FDC-curve is described. I would like to recommend to add a short and concise description of the total FCFC-model. From my point of view, outstanding readers of the paper should be able to understand the basics and assumptions of the model applied in this study without reading some furthers papers or the model manual. Without such a description, the reader has no sufficient information e.g. how an increase of forest cover is incorporated in the FCFC-model. The quality of fit is described by the Nash-Sutcliffe Index (NSI). What are the ranges for the FCFC-model for a good or bad fit ?. In addition, as far as I know, NSI was mainly designed for discharge rates and is mainly sensitive to a good correspondence between observed and calculated peak flows. Is NSI really appropriate for a description of the fit of predicted and observed FDC-curves ?.

Chapter 3.2.1 I would like to recommend that information about the discharge regime (perennial of ephemeral), periods of pre-treatment and post-treatment and the prior land use before plantation should be included in Table 1. There is no mention in the paper of the land use prior to afforestation. Furthermore, which type of forest were used for afforestation, age of forest etc. ? These informations are essential for the analysis and discussion of results. This is illustrated e.g. by Fig.5. Chapter 3.2.2 Climatic data Similar to the model description, the reader should understand how meteorological input data are preprocessed for the application of the FCFC-model. E.g., the processing from catchment averaged annual rainfall, the interpolation to monthly rainfall and the converting to daily rainfall is difficult to understand. In addition, was pan evaporation measured in each catchment or were these data interpolated and how ?.

Chapter 4.1 In Fig.5, there is no uniform relationship between forest cover and the different FDC-curves. High areal proportion of forest cover > 60% such as in the catchments Burnt out Ck, Pine Ck or Red Hill showed significant differences between the

different FDC-curves. However, FDC-curves from Traralgon Ck showed only minor differences despite an areal forest cover proportion of 58 % (Fig.5). In contrast to that, FDC-curves from the Upper Denmark River with a forest cover 15 % showed higher differences between both FDC-curves. The FCFC model do not take into account the temporal dynamics of a forest cover with root water uptake changing with forest age and thinning. These aspects and the corresponding limitations of the model should be shortly discussed.

Chapter 4.2 In Fig.6, mean annual streamflow reductions calculated by the method of Zhang et al. (2001) as a part of the FCFC-model, which is not described in the paper, were compared with corresponding ones estimated by time-trend-analysis according to Zhang et al. (2011), which is also not described in the paper. Obsviously, the latter ones were used as a quality measure for those simulated by the first method. Therefore from my point of view without no more information about both methods, the comparison of both estimated reduction rates in Fig.6 shows only a limited explanatory power for an outstanding reader.

Chapter 4.3 Comparison between predicted and observed FDCs The authors state at page 388 that "all the catchments showed good agreement between the predictions and observations, except for one or two other catchments". These findings are mainly suggested by the NSI-data provided in Table 3 with only one catchment Traralgon Ck with an NSI < 0.8. However, the contents of Figure 5 indicated also some discrepancies between predicted and observed FDC-curves in catchments with NSI >0.8. Examples are the Bombala River catchment with an NSI of 0.86 and the Red Hill catchment with a NSI of 0.80. From my point of view, a more detailed explanation where and why the predictions were more or less accurate would improve the paper. This leads also to my hint in the review of chapter 2 with the question of the suitability of NSI for the analysis of the fit between predicted and observed FDC-curves. This should also be discussed by the authors.

Chapter 5 Discussion The relevance of most of the statements in this chapter (exam-



ples: page 389, line 10-28, page 390, line 5-21) are difficult to judge without reading the cited references. Therefore, the authors should take into account to add some more information about the data, model and methods to enable the reading of this paper as a standalone publication.

Technical remarks Please add the sources of Fig. 1 and 2 (FCFC-Manual ?). Fig. 3: legend and descriptions are very small

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