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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.

L. Zhang et al.

lu.zhang@csiro.au

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Comments from reviewer #3:

The paper is well written, with clear objectives. The topic is an important subject. However, I have the following comments for revision consideration.

Q1. The results are mainly two folds. The first is on assessment of plantation expansion effect on streamflow regime using DFC, while the second is on the model test. For the first aspect, the authors compared DFCs between pre-treatment and post-treatment periods and then drawn conclusion on the effects of plantation on streamflow regime. My question is how the climate difference between two periods influences the conclu-

sion. Climate may be drier in post-treatment period than in the pre-treatment. In addition, several selected watersheds (Darlot, Delegate River and Upper Denmark) have lower plantation coverages (13-15%), but showed similar responses with other watersheds where much higher plantation coverages experienced. Such flow responses to lower forest changes (13-15%) seems counter-intuitive particularly for those large watersheds. More explanations are needed.

Response to Q1: Changes have been made to provide more information on the rainfall differences between the pre-treatment and post-treatment periods and its impact on streamflow. The detailed discussions (in Section 5) are as follows.

The combined effect of these factors means the soil water store in these catchments drained more slowly, maintaining baseflow throughout the year. For example, Traralgon Creek has an index of dryness of 0.86, representing a wet and perennial catchment. The soil depth of the catchment is over 2 meters with soil water storage capacity of 270 mm as estimated by McKenzie et al. (2000). The flow from the catchment remained perennial despite of relatieve large proportional plantation expansion. On the other hand, the ephemeral catchments are relatively dry catchments with the index of dryness greater than unity. These catchments have winter dominated rainfall and are small in size. During the dry period (e.g. summer), soil water store of the catchments drained quickly, leading to zero flows. The presence of plantation in these catchments enhanced evapotranspiration and lowered soil water levels significantly. As a result, substantial proportional reductions occurred in the low flows with an increased number of zero-flow days. For example, the Upper Denmark River has an index of dryness of 1.36 with a strong winter-dominant rainfall. During summer, average monthly rainfall is about 25 mm, while potential evaporation exceeds 100 mm. The catchment has shallow (e.g. less than 1.0 m) duplex sandy gravel soil with a permeability of 28 mm/hour (Bari et al., 2004). After the plantation development, low flows in the catchment reduced considerably with greater number of zero-flow days (see Figure 5).

Q2. The second major result is on the model test. Since this is the first peer-review paper to show the model test (the previous publication seems a government report), it would be useful to provide more details about the model. It seems that the current version did not give enough details for readers to assess the model.

Response to Q2: Changes have been made to provide a more detailed description of the FCFC methodology and the input data. Please refer to the response to the first comment of reviewer #1.

Q3. The paper uses hydrological regime. In fact, it is about high and low flows. However, hydrological regime involves more such as timing, change rates etc. in addition to frequency and magnitude. The authors should mention a broad scope of hydrological regime in spite of its narrow focus. This will provide reader with a context.

Response to Q3: Changes have been made to acknowledge a broad scope of streamflow regime and its specific use in this study. The following texts have been added in the revised manuscript:

"Streamflow regime has been used to describe hydrological characteristics encompassing seasonal pattern, magnitude, frequency, duration, and inter-annual variation of streamflow (Haines et al., 1988, Sanborn and Bledsoe, 2006). An important step in predicting changes in streamflow regime is to select an appropriate statistics that can be used to describe various streamflow regimes found in catchments. In this study, streamflow regime refers to distribution of streamflow as represented by a flow duration curve (FDC)."

Q4. How does the model (FCFC) deal with forest change? More elaborations will be useful.

Response to Q4: Forest cover change is an input to FCFC and it is used to predict changes in mean annul streamflow and flow duration curve. More information has been provided in the revised manuscript. Please refer to the response to the first comment of reviewer #1.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/9/C1643/2012/hessd-9-C1643-2012-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 379, 2012.