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Hydrology and Earth System Sciences Discussions

Interactive comment on "Changes in land cover and stream flows in Gilgel Abbay catchment, Upper Blue Nile basin – Ethiopia" *by* T. H. M. Rientjes et al.

Anonymous Referee #2

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General comment: The paper presents the major concern about the change in stream flow regime and land cover of Gilgel Abay catchment, upper Blue Nile basin, Ethiopia. The paper has been written well and the introduction, methodology and results and discussions have been described well. Therefore the paper is considered as a good contribution for Water Resources Management of the Lake Tana sub basin and hence, the paper is within the scope of HESS special Issue.

However, the paper needs further improvement by including scientific literatures about stastical trend detection tests and to arrive at a strong conclusion about the comparison

of these three catchments, land cover change detection through satellite imagery for the rest two catchments (Gumera and Megech) would be essential and improve the quality of this study.

Specific comments:

P9569 L21 Indicate the time of Central Statistical Authority L29 the authors generalized that high rainfall intensity aggravates deforestation. But this might not be true in the areas with good drainable soil. Add scientific literatures regarding this issue.

P9570 Add recent published work in Gilgel Abbay catchment see (Uhlenbrook. et. al., 2010) and also scientific literatures about the MK test. See recommended references. P9571 L20 Why you chose Gumera and Megech catchments as a comparison? Why not Koga catchment? Do you think Gumera and Megech are neighbors to Gilgel Abbay? L23 Bahirdar is not the only station for Gumera catchment. You have to revise rainfall stations with in the catchment. E.g DebreTabor, Wereta etc. Due to high spatial variability, BahirDar station which is located around the outlet of Gumera station can not represent ∼1372 Km2 catchment area of Gumera. P9573 L17 Topographic map was not produced during 1973. How do you do the ground truthing? L23 In land cover classification forest includes area with high density trees which include eucalyptus and coniferous trees. However, mixing plantation forest with natural forest may give misleading conclusion about deforestation and its impacts on streamflow. In the area eucalyptus plantation is widespread. Identifying plantation forests with natural forest is important to see the effects of deep rooted trees like eucalyptus which affects significantly the stream flow availability. P9575 L5. Add literatures why previous studies used MK test to assess the significance of trends in hydrological time series? Why not other trend tests? And at what significance level the Mk test was conducted in this paper?

9576 L23 There are different types of plotting position to compute exceedence probability. would you please give scientific reasoning about the selection of Weibull formula rather than an arbitrary selection. P9578 L23 MK Test has been applied to test any

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significant trend in stream flow. But it was not indicated in methodologies that clear procedure about the MK test. For instance checking any serial correlation exists in the time series before applying the MK test to time series directly.

The results in section 4.3 describes about the MK trend test. However, discussion about the trend test results, detection of change in stream flow and land cover detection have not been discussed in an integrated way. Linking the results of trend analysis and land cover change detection would substantially strengthen the results and the conclusion too. P9579 L14 On what basis you selected the windows for change detection as 2n=10? And in fig-3 the whole time series in the x-axis was not presented. Does the window include 1973-2001? P9580 L18 the window period for Megech catchment should be1982-1993, 1994-2005 not 1982-1984 and evaluation of rainfall stations for the studied catchments using ‘’t” test with similar window period as stream flow would substantiate the results of stream flow change detection. P9581 L14 the low flow index for Gumera catchments seems exaggerated in the third period. How far the authors check the data sets (stream flow) in these catchments? Error in estimating rating curve constants significantly affects the both trend and change detection analysis. P9583 L25 In section 4.5 the results of rainfall analysis corroborated by stream flow analysis this suggested that the change in stream flow was due to the change in rainfall. But you concluded that land cover change has been the reason for the stream flow change. Is that the climate or the land cover change have more important for the change in hydrological regime? Would you please discuss the climate change study in Gilgel Abay catchment by Abdo et al., 2009? L26 be consistent with the term catchment and watershed in this paper. P9591 Table 4. Check the area of total GL in conversion matrix 67? Or 65.7 Km2? P9593 Table 6 the results from MK test reveals that a decreasing trend of annual stream flow for Gilgel Abay catchment. However, if you apply Spearman’s rank correlation test you will not find any trend in annual stream flow. See for example MSc. Thesis by Ashenafi Seifu Gragne WSE-HWR-07.03, April 2007. Even for all monthly stream flow the direction of the trend and its significance is different for the two trend detection tests. Therefore, how could you confidentially interpreted your

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MK test in this study?

P9594 The results presented in Table 7 further strengthen by including trend analysis of low flows, high flows and seasonal flows (clear spring, autumn, winter and summer) in these three catchments.

Minor comments: P9580 L14 section 4.4 edited as section 4.5 P9594 Table 7 the analysis period for Megech catchment should be consistent (1994-2005) not (1994-2006)

Additional References:

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