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 statistical 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.
Reply : We thank the reviewer for these encouraging comments. Following the comments of reviewer 1 we discard any analysis of Megesh and Gumera catchments by absence of a land cover changes assessment by supervised classification. Such assessment is very time consuming and execution is not feasible for this work. A field campaign is scheduled for September 2011. Following the comments on the literature review on trend detections tests we added more extensive descriptions.

Specific comments:
P9569
L21 Indicate the time of Central Statistical Authority
Reply; A reference to this statement has been added

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.
Reply: We thank the reviewer and acknowledge the remark. We have modified the manuscript to better discuss the relation between rainfall, hydrological and erosion processes.

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.
Reply : Some recent work on the Gilgel Abay and Lake Tana basin area at large is added. A more extensive review of recent work is available in Rientjes et al. (2011). Citations on the MK test are added in section 3.4.

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?
Reply: Results from Megech and Gumara have been removed by absence of a land cover changes assessment by supervised classification. The criteria to select stations are the length of the observation period and the completeness of the time series. It proved that only three stations were suitable that are distributed across the Lake Tana basin area. “Neighboring” in the context above does not imply that catchments are interconnected but indicates that catchments are relatively close to each other.

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 cannot represent _1372 Km2 catchment area of Gumera.
Reply: We thank the reviewer for the comment but note that other stations have a lot of missing data. For instance D/Tabor has lots of missing data ranging from few months to a complete year in the period 1988-1993. Results from Bahir Dar and Gondar have been removed by absence of a land cover changes assessment by supervised classification.

P9573
L17 Topographic map was not produced during 1973. How do you do the ground truthing?
Reply: The comment is not clear to the authors. As common in (any) supervised land classification procedure, a topographic map is simply required as a reference to the selected locations. The map is not explicitly used to assess land cover.

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 stream flow. 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.
Reply: We agree to the observation that different forest covers may have different hydrological impacts. The reviewer states that deep rooted eucalyptus trees significantly effects stream flow availability. This however is difficult to substantiate since a) a very detailed field study is required on hydrological impacts by re-forestation and b) the area covered of reforestation presumably should be extensive to be able to observe 'significant' changes in stream flow. We are aware of reforestation by eucalypt trees but the reforested area still is relatively small. We have not further addressed this point in the manuscript but acknowledge the result in Bewket and Sterk (2005) who presume that reforestation by eucalypt trees in the Chemoga catchment probably is the main cause why low flows are affected.

*Bewket W, Sterk G. 2005. Dynamics in land cover and its effect on streamflow in the Chemoga watershed, Blue Nile Basin, Ethiopia. Hydrological Processes **19**: 445–458*

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?
Reply: We added a more extensive description as requested by the reviewer. The literature review has been extended and the significance level is indicated.

P9576 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.
Reply: We elaborated on the selection of the Weibull formula as compared to Gumbel and Fréchet formula.

P9578 L23 MK Test has been applied to test any 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. \
Reply: We did not apply a serial correlation analysis by our own research findings in Haile et al. 2009, 2010, 2011. In that work it is shown that rainfall is highly variable over time and space while serial correlation of stream flows in Gilgel Abbay proved to be very weak. A comment has been added to the manuscript. Moreover, in the work of Tesemma et al., (2010) there is no mentioning that serial correlation effected results of trend analysis in the Gilgel Abay. In the result and conclusion sections more attention has been paid to link the results of land cover and stream flow changes.

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?
Reply: We selected 2n=10 by findings of previous studies and though a simple sensitivity analysis by ourselves. We note that, similar to the previous studies, also in our study results are not much affected by the window size. We added few sentences to the manuscript. The window covers the period 1973 – 2001 as indicated in the annotation.

P9580 L18 the window period for Megech catchment should be 1982-1993, 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.
Reply : We removed the analysis on the Megech and Gumear catchments.

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.
Reply : We removed the analysis on the Megech and Gumear catchments.

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?
Reply : Our analysis shows that both rainfall as well as land cover changes contributed to the change in stream flow. However, we found it non-trivial to single out whether rainfall or land cover contributed more since this requires use of rainfall-runoff models and much more analysis on actual evapotranspiration and how such evapotranspiration effects water storage in the subsurface and consequently stream flow. We note that the section has been rewritten.

L26 be consistent with the term catchment and watershed in this paper.
Reply: We checked the manuscript and changed watershed to catchment

P9591 Table 4. Check the area of total GL in conversion matrix 67? Or 65.7 Km2?
Reply : The value is correctly entered (i.e. 67)

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 MK test in this study?
Reply : Our confidence with the MK test depends on the p-value with our confidence increasing as the p-value becomes large (close to 1.0) and our confidence drops as its values approaches 0.0. We note that the higher the MK test statistic (S) value the stronger the trend is. Though not included in the present study, a simple regression shows there is some trend in annual flow of Gilgel Abbay.

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.
Reply: Instead of looking at low flows and high flows we did analysis on monthly base as shown in Table 6.

Minor comments:
P9580 L14 section 4.4 edited as section 4.5
Reply: done

P9594 Table 7 the analysis period for Megech catchment should be consistent (1994-2005) not (1994-2006)
Reply: Results from Megech and Gumara have been removed.