

Comments to the Authors:

Review of 'Inter-annual and seasonal trends of vegetation condition in the Upper Blue Nile (Abay) Basin: Dual scale time series analysis' by Teferi et al.

I would like to congratulate the authors for a strongly improved manuscript. The new version of the manuscript was very much easier to read and it was very much easier to follow what were done during the study. Very well done. However, I am sorry but I still have found many points and comments, which I consider need clarification before this manuscript can be accepted for publication.

Abstract: It has improved a lot. P1 L35 and P2L1: What do you mean with more? More than what?

P4L22 Which country?

P6 L6 Incorporate into the manuscript why you used monthly data instead of bimonthly data. A future study is not a reason to use a less good product in this study. I hence still think you should change the analysis to use bimonthly data instead of monthly.

P6 L13 It sounds like the MODIS products is already filtered for these conditions when downloaded. This is not the case, write down exactly which quality flags you applied for filtering the data set.

P6L26 MDOIS should be MODIS.

P7. Include the information in response to comment 14, that the HANTS is done iteratively, how many iterations, and that it fits to the upper part of the curve.

P7L30. Was the HANTS run on bimonthly data? According P6L7 GIMMS was aggregated before the HANTS analysis. Be consistent and apply the same method for both MODIS and GIMMS. Specify if the aggregation was done before or after HANTS.

P7L30 Bimonthly not biweekly

P8L30 Include in this example that it is for GIMMS data that this example is valid.

P9L14 Describe what all parameters are. Why only amplitude 0 and 1, why do you not describe amplitude 2? Same thing for the phase 2, describe them all.

P9L24. Again indicate that this is only valid for the GIMMS analysis.

P10 L15 describe why only 5 major seasonal trends

Section 2.6

I still do not understand why to do the petitts change point analysis. If the BFAST gives you more information than Pettitts, why do the Pettitt? If you necessarily want to keep both analysis, you should justify the reason in this subsection.

P12 L15 What does the percentage stands for? 3.8% per year, would generat a 120% increase over the 25 year study period. Should it not be 0.377%?

P12 L20-P12L27 I am not certain I understand this. Please explain somewhere in the manuscript, either here or in the method section, why a positive difference between linear and MK indicates that linear is better than MK.

If a positive difference indicate that linear is better than MK for areas with a positive trend, then a negative difference for areas with a negative trend should again indicate that linear is better than MK. But according the manuscript, MK is better for negative areas since the difference is negative. This result does hence not make sense, in case I understood it correctly.

P12 L32. Make sure that the figures and tables come in the correct order. As it is now Fig 7 comes after Fig 2.

P13 L2 This number cannot be correct. It would indicate that NDVI increased with ~ 0.83 over the 11 years. It should either be $0.0768/11$ years, or 0.00768 per year. Same for the other numbers in this section.

The section 3.2.1 was very well written. In the GIMMS section, you state that you found some major types of changes and then you describe these different classes. So, I do not understand why is not section 3.2.2 about MODIS written in the same manner.

Why do you suddenly start calling it A1, A0 etc. Previously you have written Amplitude 0. Be consistent, and use the same terminology throughout the paper.

P15 L6 There is no subplot (a) in Fig 8.

P15 L8-9. The dominant classes are never described, they are only included in a legend in Fig. 8. Why do you not do as in subsection 3.2.1 describe the main classes you have found, what they look like, and where they are located?

Why do you suddenly start talking about ROIs. In the method section ROIs are not included before the change point analysis. I hence suggest to describe the main trend classes that you found in the MODIS analysis. Based on these trends, and the trends you found in GIMMS, you choose some ROIs where you study change point analysis. These ROIs should hence be described in the next section about trend break analysis.

Subsection 3.3.1. Not clear what the different ROIs are representing. Describe what all ROIs are representing.

P16L26 Why is it suddenly classes? According the method section, the trend break analysis was done in ROIs, not for classes?

Subsection 3.3 I still do not understand why you did the Pettitts change point analysis. The BFAST analysis seems to generate much more robust results. Looking at Fig 10, I do not see any break in the NDVI time series at 2004 where it was indicated in the Pettitts analysis that a trend break should be seen.

P18 L13 Include the info about burning that you gave in the response to comments.

P18 L23 No, a significant increase in mean NDVI but without any changes in the other shape parameters do not indicate a lengthening of the growing season. It is very clear in Fig 4a, that the curve is simply moved upwards, the growing season is not longer. You had changed this according to your response to comment #27.

It has previously been shown, based on GIMMS data, that the greening trends in the Sahel is mainly attributed to an increase in the maximum values, whereas the length of the growing season has not increased (Heumann et al 2005).

What is myriad? Please then give references.

Your main conclusion on P19L2-3 is still correct. Yes the increase in vegetation greenness indicates increased vegetation productivity, but not due to a lengthening of the growing season but due to an increase in greenness.

P19L9-10 please rephrase. Hard sentence to understand.

P19L14 Could forest plantation be a cause?

P20 L1 According results and fig 8 it should be 5 vegetation changes?

P20 L4 I do not agree with this statement. It looks like ROI 5 and ROI 8 had double season in both 1981 and in 2006? Since they have double seasons in both periods it does not indicate a change from shrubland to irrigated double cropping.

P20 L5 I would not consider a change in NDVI for ROI 3 from an ~average of 0.84 to ~average of 0.83 a significant change indicating degradation. Please use same scale on y-axis to clarify these things in fig 9.

P20 L13-L17 Again, I do not agree with the results of the Pettitts analysis. Are you sure that they are correct. Looking at the time series of NDVI in fig 10, it is clear that there are browning trends, but I cannot see any clear breaks in the point in time where Pettitts change point analysis claim to find breaks in 2004-2006. Again, I would recommend to stick to BFAST.

P20L18=> very good discussion about possible reasons for the browning trends.

P22L15 Do you have any explanation for why it is highest in the Belles sub basin?

Tables and figures

Table 6. When looking at the time series of NDVI in Figure 10 I do not see these break points. I would instead trust the BFAST. According the legend there should be negative signs in the table, but there are none.

Fig. 2 Clarify which color is 0 in (a), (b), and (c). Why do you show mean and covariance in Fig 7 but not here? Use the same color scale in c) and d), to make it easier for the reader to compare the results.

Fig 3 is never referred to, and there is something wrong with the figure: no legend, no latitudes, no figure in subplot(b).

Fig. 5 Why is not all ROI presented. 8 subplots is not too many. Explain which ROI describes which class in the figure legend.

Fig. 6 Which ROI are these different classes? In (b) perhaps include amplitude 0 on a second y-axis.

Fig. 7 In fig 2 the difference between MK and linear is included, why is this not done in figure 7? The year is missing in the reference (Shukla et al)

Maybe combine fig 8 and fig 3? Change ROI from grey to black, they are very hard to see as it is now. Latitudes are missing.

Fig. 9 Why not using the same scale on the y-axis for all subplots, makes it easier to compare. Why not include the first and last year of the GIMMS data for the ROI in these plots as well. Would further highlight when the changes take place. According the figure legend, the ROIs are based on the amplitude composite image Fig 8, whereas according the method section, they are based on the classes in both GIMMS and MODIS?

Fig 10 Why did you not present the analysis for all 8 ROIs?