Earth Syst. Dynam. Discuss., 6, C69–C77, 2015
www.earth-syst-dynam-discuss.net/6/C69/2015/

Earth System Dynamics
Discussions
Open Access

Interactive comment on "Inter-annual and seasonal trends of vegetation condition in the Upper Blue Nile (Abbay) basin: dual scale time series analysis" *by* E. Teferi et al.

Anonymous Referee #1

Received and published: 26 February 2015

Review of

'Inter-annual and seasonal trends of vegetation condition in the Upper Blue Nile (Abbay) basin: dual scale time series analysis ' by Teferi et al.

General remarks:

Teferi et al presents a very interesting study regarding NDVI trends in the Uper Blue Nile Basin in Ethiopia. The manuscript contains comprehensive and valuable analysis from a region where land degradation may have a pronounced impact on ecosystem functioning, and it is thereby relevant in relation to the scope of Earth System Dynamics. However, the manuscript is not very clearly written and it is occasionally very

hard to follow what was done. I would recommend some major revisions before being published, see comments below.

Specific remarks:

P170 Very short about seasonal trends in the abstract. Include more results.

The introduction is generally very well written, however I lack some more background d information regarding the seasonal trends. There is a long introduction regarding why to study inter-annual trends, but then there are just three sentences, to justify the intra-annual study.

P173 L11 Remove frequent, as the MODIS NDVI product that you are using has a lower temporal resolution than GIMMS (16 vs 15 days).

P173 L18 MODIS stands for Moderate resolution... So it is not fine scale. Fine scale these days have a few meters resolution, not 250 m.

Sect 2.1 I would recommend to include a figure of the location of the Abbay basin within Africa including borders and perhaps the land use classification map. The different regions could be incorporated here as well. They were very hard to see on Fig 8.

P174 L5 Why is modelled evapotranspiration values interesting for this study? Remove. The text is already long as it is, and I recommend trying to shorten it down as much as possible.

Sect 2.1 Instead it would be interesting to know the types of species, if they are perennials or annuals. What is the typical crop that is grown in the region. These things affect the NDVI series a lot and are thereby relevant information, if you have it.

P174 L23 Why was this done? Why not run on bimonthly data? In the seasonal dynamics you miss a lot of information if you run on monthly instead of on bimonthly values. Already bimonthly composites have a low temporal resolution, but monthly are much worse and finding seasonal dynamics gets even more difficult. Especially in

semi-arid environments with very short growing seasons.

P174 L24 If necessarily used, why arithmetic mean? Generally maximum values are used since errors tend to have a negative impact decreasing the NDVI value.

Section 2.2.2 What kind of quality control data did you use for filtering of low quality MODIS NDVI data?

Section 2.2.3 There is no results presented which use the LULC dataset, I would include this in a figure in Section 2. 1. Instead. See comment above.

P175 L11 Use same pixel size as for the other data sets if presented.

P175 L17 The datasets are atmospherically corrected even before the MVC procedure and cloud issues should be rejected in the quality control. However there are several other issues (e.g. aerosols, haze, cloud shadows, atmospheric depth, water vapor, illumination variations, slope of the terrain, reflections from adjacent pixels and shadowing effects) affecting the NDVI values, and there is thereby many other reasons for smoothing the data.

P175 L19 Most of these issues have a negative bias, which means that the fitting should be done to the upper part of the curve. Is this accounted for in the HANTS? Perhaps making an iterating process where the lower part is removed in the first iteration and in the coming iterations it is fitted more to the upper part. See (Jönsson and Eklundh, 2004). Jönsson, P., Eklundh, L., 2004. TIMESAT - a program for analyzing time-series of satellite sensor data. Computers & Geosciences 30, 833-845.

Section 2.4 Why fit three different trends. The Median Theil Sen method is much more robust within time series analysis than OLS. Why fit an OLS at all? It is not recommended to use OLS within time series analysis and I would remove the OLS analysis completely. Then I would recommmend to stick to use the Mann Kendell test for significance as it gets confusing when reporting all different kind of trends.

P177 L25 –P178 L28 There is no reason for explaining what a OLS and a MK test

is. These are things that can easily be found somewhere else for the reader. Please remove. As mentioned above the text is already long as is.

P179 L 16 Why does disturbances shorter than 8 years not have an effect on the long term trends? MODIS time series is not more than 12 years; it must have a very big impact.

P179 L20 Why is it necessary with a contextual Man Kendell? Is it not enough with a regular MK test?

P180 L17 How was these regions of interest selected? And why did you not run BFAST for the entire region? This section needs a lot of clarifications. How did you parameterise the BFAST?

P181 L 3 Why did you use two different methods in the trend break analysis. It is confusing, I would recommend to stick to one.

Change the Title 3.1 Course scale analysis. Why course and fine scale? Maybe use GIMMS and MODIS instead?

P181 l 21 How do you know the OLS is over and underestimating? Again, why use OLS at all?

P182 L 5 Why is the linear better than non-linear just because there is a difference? Which linear test do you mean the Theil Sen or the OLS?

If you find a method which is more robust than the other I would stick to that one and only present the result from this method. It is not very clearly written as it is now. If the scope of the paper is to investigate methods, sure than you can present all these different methods, but this is not the aim of this paper, and I would thereby suggest to remove these parts and focus on the best methods.

P182 L11 What is the LM test, I assume the linear regression, but it has never been described?

P182 L 16 Describe better what these different parameters describe, prefereably already in the method section. It was described later, but it is too late and should already be described the first time they are mentioned.

P182 L 27 No, if there would be an earlier start of green-up which increases length of growing season, you would see a change in the phase. A change in mean NDVI but with no other changes would simply mean a shift upwards. Which also seem to be the case in Fig. 4a?

P 184 L10 Incorrectly written. Class 4 is the class without an increase in length of growing season and it is found in shrublands, hence the shrublands have a longer growing season. Something is wrong here. Besides, it is only class2 and class 5 that has a change in the phase. A longer growing season would require a phase change. The amplitude just indicates larger maximum values and lower minimum values, but no change in the length.

P 184 L 25 'It is beyond the capacity', change to scope

P 184 L 25-P185 L16 This is not results, it is discussion and should hence be moved.

P 184 L 18 I assume that the ROI# are not the same thing as the classes in the seasonal trends. Again, why is not the entire area investigated using BFAST? As it is now, it is very unclear why these 8 regions were chosen and what makes them interesting.

Sect Trend breaks in the seasonality parameters. This is not clearly described in the method section how this was done. Clarify. How is this analysis done?

P185 L 21 Why is it interesting to make a break point analysis for the Amplitude 0? It is the same thing as the mean NDVI, and should thereby not differ very much to the NDVI time series. The other parameters though, they are the ones that show the real dynamics in seasonality. Why is the other parameters not presented, and analysed properly?

P185 L14 Is the trend break for the phase 1997 the same across the entire class 2 area? Please clarify how this analysis was done.

I would suggest to rewrite the results so that instead of presenting fine scale and course scale separately, present the Inter annual trends first, both MODIS and GIMMS, secondly the seasonal trends both products and finally the trend breaks, both scales. I think this would make the text much smoother and easier to read. Then you could compare results of the two. You should use the same method when analysing both data sets. As it is written now, the reader basically read the same results twice.

Why is the analysis so different for GIMMS and for MODIS. I would use the same analysis for both products. As it is now, it is very hard to understand why you use different methods for the different data sets.

P 186 L 5 Figure 7a shows. . . (Fig 7b) remove a and place in the end: (Fig 7 a, b)

Whys is table 4 and 5 only presented for MODIS and not for GIMMS as well?

Why different titles in the subsection describing results of GIMMS and MODIS? It makes the text harder to follow. It feels like it is two different authors doing the GIMMS and the MODIS sections, and using completely different vocabulary. This makes it very hard to compare the analysis for the two different products. Try to be consistent and use the same words and analysis throughout the study.

Whys is the seasonal trends investigated in classes for GIMMS but in regions of interest for MODIS? ROI is not used until the trend break analysis for GIMMS. It gets complicated for the reader to follow when different methods are used. Under the method section ROI is not used until the trend break analysis. Please clarify. I would suggest using trend break analysis for the entire area instead of for ROIs.

P187 L2 How can it be about 207? There are 5 different parameters with either a positive, no, or a negative trend. There is not 207 different possibilities?

P188 L18 Is the sampled areas the same as the ROIs?

P188 L20 What is the seasonal component?

P188 L18 Why again using two different methods: Petitts and BFAST? And why use different methods for GIMMS and for MODIS?

P189 L 19 What do you mean the reason for the burning is not clear? I assume it is a slash and burn agricultural technique is for clearing the area from shrubs and forest to create fields or natural fires.

P190 L 4 Class 1 does only have a trend in mean NDVI, which is not describing a change in seasonality. This is not a seasonality term.

Please add References to the sentence P 190 L8.

Remove that it is beyond the capacity of this study. This is the discussion, so you should put your results into perspective.

P193 How is the trends in if you use the overlapping period for MODIS and GIMMS?

Wang et al 2012, 'Impact of sensor degradation on the MODIS NDVI time series' (RSE) have shown a strong decreasing trend in the NDVI time-series of Terra. Could this explain the decreasing trend in the MODIS product?

P194 L10 Were there any trend breaks in the GIMMS series after 2000? Otherwise it is natural that there are no breaks in MODIS either.

P194 L20 Why did the Petitts method show different results to BFAST? Again, I would recommend to stick to one mehtod, the one that you find most reliable and only present results from that analysis.

Tables and figures:

Table 1. Why minimum retained data points so different for GIMMS and MODIS?

Table 2 I would recommend only to present the Theil Sen and skip OLS, see above. Why is the no statistics of the MK method presented? Why are all slopes included? Is

it not enough to present the statistically significant ones?

Table 3 What is the numbers within brackets? What does small sig. changes means?

Table 4 why is the percentage of the total interesting? Is it not enough with the % of sub-basin area?

Mention in all table and figure captions if the analysis is based on MODIS or GIMMS.

Table 4 and 5 can easily be combined.

Table 5 should the slopes not be negative for the browning trends?

Table 6 What does ROI stands for? Make sure that all table and figure captions explain everything within the tables and figures so that you understand them without having to read the text. What are the different years within table 6. No explanations at all given.

Many figures are very difficult to read, text must be larger so that you can see what it says.

Figure 1. The legend is turned the wrong way. In captions write map of instead of spatial distribution of. . .

Fig 2. If the MK trend is not linear, it does not make sense to compare the two slopes. It is two completely different parameters, why calculate the difference?

Legend figure 3, make boundary of the basin to line instead of rectangle. As it is now, it looks like it is the white area in the N part which you consider. What is this white area? In caption explain what the phase 1 is as well. Now amplitudes are described but not the phases. Be consistent.

Figure 4. I do not see a lengthening of the growing season in Fig a), the line is just moved upwards. There is only a lengthening of the growing season for class 2. Why is not class 5 shown? The figure caption is very blurry, shorten down and make more concise. Perhaps same scale on the y-axis?

Figure 5 Why is not all ROI presented? Is each ROI one pixel or several? Describe clearer what St, Tt and et is.

Fig 6 Again where is class5? What does mu1 and mu2 stand for? Is this the average parameters for the entire areas with the different classes?

Fig 7 Modis 250 m, not mm. I would recommend to filter the slopes so that all non-significant slopes are filtered out in fig c).

Fig 8. Very hard to follow. Too much info in the same fig. I would recommend placing the name of the different regions and in an overall map in the study area section. By the way, why are borders just located in some figures but not all? Figure b and c, is very hard to get any information out of. I would rather recommend 5 sub-figures with trends of amplitude0, amplitude1, etc.

Figure 9 Again, why is the MODIS series investigated using ROI but not the GIMMS? Why not using classes as was done for GIMMS?

Figure 10 and Figure 5. I do not see why BFAST captured breaks in Fig 5a, when no breaks were seen in Fig 10 a, b and c. For example 10 a, it looks like there is a strong decreasing trend in the seasonality after 2004, which was not captured by BFAST. Possibly, this could be explained by having a long moving window in BFAST. Can you please describe in the method section how you parameterised BFAST, as this is very important for assessing the reliability of the produced results?

Interactive comment on Earth Syst. Dynam. Discuss., 6, 169, 2015.