  - Dear Authors,

Beste Willem, Floris,

I have received two reviews, which are generally positive about your manuscript and its scientific value for publishing it in this journal. I believe the comments can help to clarify the methods/results/discussion and improve the presentation.

Reviewer 1 is most critical and has a number of  comments that should be dealt with, a significant one is the lack of discussion on the variables responsible for rainfall change. Also some statements are vague and contradiction between conclusions and abstract should be resolved.

Reviewer 2 is very positive about the value of the paper, but still has a number of major/minor comments that I would you to address.

Other comments:

Section 6 should really be Discussion and not also a summary.

Please, provide a point by point reply on all comments. Also adapt the abstract according to the required style for this journal, see guide for authors.

-**Reviewer 1**  
  
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The authors analyse rainfall data from the BoM dataset for two areas in New South Wales/Victoria and in Queensland and try to establish a link between sudden land cover changes and rainfall changes. . The NSW/VIC area was affected by a large forest fire in 2003 which burnt a large area in the smoky mountains within about one month. Thus this Land use change (Luc) occurred on a very short time scale and can be treated as instantaneous within a 25 years rainfall data observation period. Since than the forest is regrowing, leading to a slow recovery of the forest cover.

The second site in Queensland was deforested over a period of about one year also in the same year 2003/2004. The deforestation is part of a longer land use change and is not recovering as the area is now continuously converted and used for agricultural land. The LUC here is permanent.

The procedure to investigate a possible link between ‘step function’ land cover change (LCC) and rainfall data for a larger area, exceeding the pure LCC area requires first to detrend and to deseasonalize the rainfall data, shown in Fig. 4, before a statistical analysis can be applied.

To investigate, whether a local LCC can be linked to a rainfall trend, several large scale processes like the Pacific Decadal Oszillation, The Indian Ocean Dipole and the Southern Oszillation Index as well as El Nino and La Nina effects have to be taken into account as well as pacific sea surface anomalies. These large scale variations can have a distinct impact on the Australian rainfall frequency and intensity distribution.

Initially there is not obvious step function visible in the data. Nevertheless the authors try to apply a regression model to remove further variability in the rainfall data.

Section 4 then describes the statistical method and tests used and Section 5 describes the results which show a slightly higher probability for a significant trend in the NSW /VIC region than in the QLD region.

Finally the results are summarized and discussed.

Comments:

General remarks:

The paper is an interesting approach to investigate rainfall trends linked to land use or land cover change. For me as an experimentalist, although familiar with basic statistics, however, it is difficult to follow the argumentation chain in the statics. Section 4 and 5 are thus difficult to read and to understand. The statistical procedures are taken from other literature which is properly cited. However, a modification of a statistical procedure at least has to be described.

Not sure what modification the reviewer is talking about. Need to identify. Possibly explain detrending on line 268

Line 269 should we do spearman rather than Pearson?

Specific remarks:

On Line 596 to 601 the authors write that both regions QLD and NSW/VIS show a stronger indication of a change.

However: The results show, that overall a chance of detecting a rainfall change was small, which is related to the strong natural variability of the rainfall in Australia. However, the location of the positive tests on the tail of the distribution suggests some support for the hypothesis that vegetation cover change affects local rainfall.

This is a very vague statement and the reader is left without any clear result.

Looking at the graphics the results for QLD in Fig. 13 and 14 seem to agree but this is not in agreement with fig. 8. Figs. 8 and 13 for NSW look more likely for a correlation between forest cover change and rainfall. However, both are difficult to get in agreement with Fig. 12.

The conclusion , line 734 to 738 is not in agreement with the abstract. ‘the two methods agree on detecting a significant step change in rainfall in QLD’.

The abstract: ‘dramatic tree cover change between 2002 and 2005 did not result in strong statistically significant precipitation changes’.

Change wording so it is not “dramatic”

Hence finally the reader is again left without a clear statement whether a rainfall trend is detectable or not. I would assume from the data presented in the figures that for the NSW site it’s more likely to detect a step function in rainfall, although as the authors write by themselves the data base with only a few years after the LCC is short and a very dry year 2006 could probably disturb the results. The analysis was submitted in 2017. Why are only data until 2008 used in this study, could a longer time series provide clearer results?

Ok, this is a good point. It would not be too hard to download the data for the rest of the period and to rerun the analysis. Who knows it might show something interesting. So I think we should try this

The QLD site should have constant land surface conditions. How fast it the forest regrowing in the NSW site? The authors claim a slow regrow, how slow?

Several years at least. Also the QLD site is not constant as there is land clearing, that is the whole point

I am totally missing any discussion, which physical variables could be responsible for a rainfall change and where to expect such change on a regional scale. Land clearing has several effects: surface roughness, albedo, evaporation and possible also on secondary aerosol or aerosol precursors that finally could act as cloud condensation nuclei. While effects like albedo have a direct local effect on the initiation of convection, evaporation and secondary aerosol production could affect cloud droplet size distributions on a regional scale downwind of the cleared area.

Other comments

Many of the abbreviations ET, SOI, PDO, MDB, ACT in fig. 2,  SAM etc are not properly explained on their first occurrence in the text.

-**Reviewer 2**  
  
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'Observational data analysis of land surface effects on local rainfall'

By C. Liang, R.W. Vervoort and F.F. Van Ogtrop

The manuscript presents a study of two Australian regions with different climates looking at the effects of land-surface coverage on rainfall. This is performed by looking at a catchment that has had extensive land clearing and another where the land surface coverage has changed as the result of bushfires. The paper uses observational data analysis to evaluate whether a step change in the land surface results in a step change that can be identified statistically in the rainfall. This evaluation is presented using gridded rainfall and land-surface datasets.

A nice comparison between land-surface change with different characteristics and rainfall is provided, including the commentary provided on the influence of drought on the results. The use of spatial data allows the study to consider larger regions rather than just where land-surface is known to have occurred. The method presented in this paper is generally clear. Although there is a lack of clarity in parts surrounding how the gridded data is precisely used in each evaluation stage.

The authors have provided a paper that should be of interest to a wide community of readers and has a focus suitable for the journal's scope and readership.  While the paper warrants publication, there are a number of minor issues that the authors should to address prior to publication. Most of the following comments relate to the written presentation of the article. These issues are:

Major comments:

- line 713 - '... the inclusion on the anomalous rainfall year...' - It would be nice to include more discussion here regarding this (perhaps from earlier) or demonstration of effect with 2006 removed from the analysis.

- Abrupt to start Section 4 with 'As shown in figure 4 ....even though the data is deseasonalised'. Providing some context around deseasonalising and detrending as part of the analysis at the start of the section would make this transition less abrupt. Perhaps the text that provides an overview of the techniques can be inserted at the start of s4 ahead of this statement and then the figure illustrating the difficulty in identifying a step-change in this data can be broached.

-Additionally as gridded rainfall data was used it is unclear if the deseasonalised and detrended rainfall shown in figure 4 is an average for the region, from a representative pixel or other? The first mention of a pixel appear on pp 21 and 22. The addition of a description of when analysis focuses on pixels (or groups of pixels) or the region would add clarity to the method. Currently the use of the gridded data is unclear in parts of the method.

Minor comments and typos:

- At the start of the manuscript many acronymns are used without being defined (these are then typically defined later).

    - e.g. SOI, IOD, PDO & ET (abstract and Section 1) - defined later in section 3

    - e.g. NSW/VIC in abstract later defined in Section 2

    - e.g. MDB on line 57 later defined on line 110

    - e.g. EVI on line 104 later defined line 179

- Figures 12 and 13 - (a) and (b) not explicitly defined

- line 293 Qld should be QLD.

- line 598 disctribution

- Figure 1 caption should read 'closed forest' not 'close forest'

- line 329 bracket is missing

- line 698 'account for' should be 'accounted for'

- line 748 capitalise Acknowledgments