Dear Prof. Kuzyakov,

Here is present our manuscript as edited following the open discussion period. I have addressed each of the reviewer comments below. I hope this is sufficient for the paper to be accepted in to Biogeosciences.

Sincerely,

Dr Scott Parsons

30/07/14 Townsville, Queensland

Response to open discussion comments on Biogeosciences Discuss., 11, 7901, 2014.

Anonymous Referee #1

Received and published: 4 June 2014

This paper compared the seasonal patterns of litterfall and leaf decomposability and quantified the drivers of seasonality in litterfall and leaf decomposability in a tropical rainforest region. Overall, this is an interesting and well-written paper. I think it is appropriate for Biogeosciences. The authors have improved the manuscript a lot from the previous version. I am glad to find that, however, I still have one concern: the authors revised "repeated measures ANOVA" to "2-way repeated measures ANOVA" to determine the seasonal difference for leaf decomposability. However, to my knowledge, I would like to just use "2-way ANOVA" because both season and plots are your factors.

SP: This was our error. The statistical test run was indeed a 2-way ANOVA, not repeated measures. I am not sure why "repeated measures" was written in the first place. This has been changed to "2-way ANOVA throughout.

Other issues the authors should pay attention:

Page 2, line 12; Page 7, lines 14 and 17. I would suggest deleting "Plots";

SP: Done

Page 3, line 6. I did not find the abbreviation "C" before;

SP: Changed to "carbon cycle" as per other reviewer suggestion

Page 6, line 3. Please check "Wieder, and Lang, 1982"

SP: Comma removed

Page 11, line14. Please keep "P = 0.010" consistent through entire paper;

SP: Changed to "P" throughout in the revision

Interactive comment on Biogeosciences Discuss., 11, 7901, 2014.

Anonymous Referee #3

Received and published: 27 June 2014

General Comments

This paper examined the seasonality of litterfall and leaf decomposability in a variety of plots in the Australia wet tropical region. A major finding of this paper was that greater levels of deciduousness led to more consistent monthly litterfall. The authors argue that this is because the larger number of deciduous species brings a greater mix of litterfall characteristics relative to evergreen forests, whereas the litterfall characteristics for the evergreen trees were more consistent across species. This is an interesting finding and an important contribution to the literature, especially because this may be relevant to forests in other regions. Overall, the paper was well written. A few specific concerns are listed below.

Specific Comments

Abstract Line 10 – the full model with statistics and P values doesn't seem to fit in an abstract

SP: I am not sure if this suggests the model results should be deleted from the abstract. I am not sure how to address this.

Intro Line 28 – "including understanding of the seasonality of litter inputs in forested ecosystems is a limiting factor" . . . this line doesn't seem grammatically correct

SP: You meant line "8" I think. Yes, agreed, "including" has been deleted

Methods Line 10-12- "total litterfall" included leaves, and leaf litterfall, is then mentioned separately following the parentheses

SP: These phrases do not occur on lines 10-12 on any of the pages in the methods. I am unsure what this is referring to.

Line 15- change "most falls" to most rain

SP: Changed for the revision

General comment for methods- Need a better description of the statistical tests used, particularly the repeated measures ANOVA, and whether the assumptions for those tests were met

SP: This has been amended as per reviewer #1's recommendations

Results Line 10- "an should be "and"

SP: I could not find "an" on line 10 or any page of the results. I searched the document and could not find this error anywhere.

Last paragraph of results- Lines 1-4- This section refers to Table 4, which is presented as a repeated-measures ANOVA. It is not clear what the repeated measures were in this case. This way this model was run needs to be clarified. As it is, it does not appear that this is the appropriate model procedure.

SP: Please see response to reviewer #1 as to how this has been repaired.

Table 4, the caption refers to sample size in parentheses, but I could not find sample sizes in the

table.

SP: They are shown as mentioned, i.e. in the "wet mean" & "dry mean columns in parenthesis (brackets) (see Table 4).

Anonymous Referee #2

Received and published: 13 June 2014

General comments

This paper investigates the seasonality of litterfall and litter decomposability in a tropical forest region and aims to explain the link between seasonality and the various biotic and abiotic drivers. The problem of litterfall seasonality in tropical regions is poorly understood and new studies such as this are essential our ability to understand and predict biogeochemical cycles in tropical regions.

The main finding of this paper is that litterfall is less seasonal at more deciduous lo- cations which appears counterintuitive given that deciduousness is a term that refers to seasonal leaf shedding. It would appear from the discussion section that the rea-son for this observation is that, at the sites included in this paper, the more deciduous sites have a higher species specific seasonal variability in responses to environmental factors, resulting in leaf shedding events at different times of the year from different species. It is not clear to me if this is a general result that applies to all deciduous tropical forests, not even to all the deciduous tropical forests in Australia. It is however clear that it is not the deciduous character itself that determines the low litterfall seasonality but the particular species composition and this should be stated clearly in the paper.

SP: This is discussed in depth in the discussion e.g. see pg 7914 L24, for talk of the importance of species composition in determining the patterns

The Methods section is lacking a full description of the statistical models used. The simple regression model chosen requires a justification for not including site effects and sample pseudoreplication.

SP: The stats models used are defined in detail in the methods. Without telling us what is missing it is impossible to properly address this. Psudeoreplication was not an issue and "site effect" are included in analyses (see 2 way ANOVA).

The data has been processed to obtain seasonality indices prior to analysis and it is unclear if it meets the normal distribution condition of the linear regression models.

SP: Non-normality was not an issue with the regression models. See the plots in Fig 3 and 4.

The inclusion of categorical variables (deciduousness) needs to be justified. Generally, a clear description of the statistical methods and the authors' assumptions is needed.

SP: This was addressed in the revision prior to online publishing. See pg 7907 L10-18

This paper is also missing a conclusion.

SP: We do not agree. There is more than one conclusion in our paper and they are expressed in the discussion. We did not feel the need/urgency to states these are conclusions because, as is discussed, there are aspects still not fully understood on this topic.

While the main question of this paper (what drives seasonality in tropical forests?) is important and yet unanswered, the data used has been previously published, the statistics are very basic and badly justified and the discussion of the underlying plant physiology and species composition processes is poor, all of which greatly reduce both the quality and the novelty of this study.

SP: Hard to address. These are new analyses of previously published data.

SP: I have addressed the specific comments below in the revision.

Specific comments

p7903 , l6 "C-cycle" replace with carbon cycle

SP: Ok, changed to "carbon cycle.

P7903 l15 "is thus essential in comprehending plant phenology": It can be argued that it is plant phenology, which determines the litterfall and not the other way around

SP: I do not disagree with that. However, we have not alluded to the causes of "litterfall" in that sentence anyway, we have merely mentioned that the factors listed are related (i.e. not the causes of one or the other).

p7903, l24 "deciduous species in seasonally wet tropical forests can shed litter as a response to new growth" Missing reference

SP: No, the reference is at the end of the sentence (Hyland et al. 2002).

p7904 l1: You need to mention what your study region is

SP: It is on the 4ᵗʰ line of the Methods.

p7905 l11 add temperature units

SP: Added in the revision

p7905 l13: "summer months" name the months, summer has different definitions in different hemispheres

SP: Added in the revision

p7907 l10: 'Deciduousness' is not an ecosystem intrinsic property, but rather an emer- gent property that results out of a combination of factors, such as climate and species distribution.

SP: Agreed. We never said it was an "ecosystem intrinsic property".

p7908 l4 It is unclear if the data on secondary species was obtained and described in a previous Parsons et al paper or if it had another source

SP: "determined in Parsons et al 2014", "determined added to line 4 before "in".

p7909 l6 "in the dry" Missing the word season?

SP: "season" added

p7911 l20 "highest annually insolation" Should this be highest annual insolation? Or highest

insolation within a year? Does the same period have both high rainfall and high radiation?

SP: Changed to "annual" yes.

p7911 l22 "in other locations globally": Which locations in particular?

SP: The reader can check the references listed there if they require this information. It refers to a lot of locations.

7915 l5 This part of the discussion is based on a regression with an r2 value of 0.2. Surely there should be a discussion of the other 80% of unexplained variation in the data prior to any other more broad implications.

SP: The variability is a high as we would expect from an ecological study of natural forest processes, especially for a composite variable like this (wet/dry season decomposability difference). As this was also the best model/fit, I fail to see the relevance of this suggestion.