Reply to Referee #2

On the time evolution of ENSO and its teleconnections in an ensemble view – a new perspective

by Tímea Haszpra, Mátyás Herein, Tamás Bódai

In this paper, the authors aimed to examine changes in ENSO SSTA patterns and teleconnections under climate change, using a recently developed ensemble-based method (SEOF). SEOF was applied on all the ensemble members from CESM1 at each time step, avoiding using statistical mean or standard deviation under a non-stationary climate.

This ensemble-based method provides a very interesting perspective to study change in the warming climate. This manuscript showed how to apply this method on the change in ENSO patterns. However, I do feel this manuscript lacks details in terms of the physical interpretation of the method (SEOF) and results, which makes the article quite difficult to follow. Also, the content of change in teleconnections which only used correlation to analyze (Section3.2) seemed to be insubstantial and did not really provide new ideas. Thus, I suggest a major review to provide more information to help readers to interpret the SEOF methods and their results. Also, for example, how do the results (change in SST amplitudes or variability and teleconnections) make sense physically? Here are some specific comments I've made:

Dear Referee #2,

We thank the Referee for the careful reading of our manuscript, and we are glad that the Referee thinks that the newly developed SEOF method provides a very interesting perspective to study the effects of climate change. We appreciate the Referee's constructive comments on our manuscript. These suggestions have helped improve the presentation and clarity of the paper, and we have incorporated them into the revised manuscript.

As we indicate in our responses, the physical and mathematical interpretation of the SEOF analysis is now elaborated in a new section (Section 2.3). We emphasize that Sec. 3.2 for the correlation analysis characterizing the strength of teleconnections and their change was not intended to provide new ideas, but rather to illustrate how to apply the SEOF-derived PC1s for teleconnection analysis within the snapshot framework, and to reveal the capability of the CESM-LE and the SEOF analysis regarding the ENSO teleconnections compared to the observations. Furthermore, this section is also devoted to study the forced changes in the strength of teleconnections, which has not been done so far for ENSO teleconnections in the snapshot framework to the best of our knowledge. Here we quote the specific comments and questions, provide answers, and discuss the changes carried out in the text.

Major comments

1. I've found it is a bit difficult to interpret SEOF method intuitively. My understanding is that: conduct EOF analysis over all the ensemble members at each time step, as an analogy to *conduct EOF analysis over a time series under a stationary climate. Therefore, each ensemble member here represents each year (under a stationary climate).*

However, currently, the majority of climate studies treat ensemble members as different possibilities caused by atmospheric internal variability. The standard deviation of ensemble members is used to evaluate the strength of internal variability (noise), while the ensemble mean is used to present the response to forcings (signal). Thus, in this study, it is confusing when the authors use the std of PC1 to represent the strength of ENSO.

I would suggest to provide more details, leading the readers to easier understand the merit of snapshot framework & SEOF since it is a relatively new method. The current descriptions (in terms of the method) lack of details and difficult to follow (e.g. L41-45; L112-116).

Response: Although the ensemble members at a given time step can be considered as the analogue of the years under a stationary climate, we would formulate the first paragraph of this comment in a slightly different way: a regression map (or the loading pattern) derived from EOF analysis in time series analysis represents the spatial pattern of a standing oscillation that characterizes the temporal variability in the SST over the chosen time interval: as it is stated in old line 115/in new line 133, the regression maps show typical amplitudes of the SST anomalies at each grid point (with respect to the mean state of the climate represented by the temporal mean of the SST fields). Analogously, the ensemble-based regression map of the SEOF analysis, obtained at a chosen time instant, represents an oscillation which characterizes the potential variability in SST across the ensemble (with respect to the instantaneous mean state represented by the ensemble mean of the SST fields), i.e., it describes a kind of interval variability of the climate system specific to the given time instant, similarly to the ensemble standard deviation mentioned by the Referee. In fact, the temporal fluctuations that constitute internal variability in a stationary climate is nothing else but the manifestation of all the different possibilities permitted by the chaotic dynamics of the system. The ensemble spread is the instantaneous analogue of these fluctuations. For more details, see Drótos et al. (2015, 2017) and Tél et al. (2019).

Regarding the second paragraph of the comment, in the traditional EOF analysis using single time series, the (temporal) standard deviation of the PC1 is a common practice to represent the strength of an oscillation that is derived by EOF analysis (for ENSO, see, e.g., Monahan and Dai 2004, Maher et al. 2018). Therefore, in this study, we use its ensemble-based counterpart to represent the strength of the ENSO at a given time instant.

Drótos, G., Bódai, T., and Tél, T. (2015). Probabilistic concepts in a changing climate: A snapshot attractor picture. Journal of Climate, 28(8), 3275-3288.

Drótos, G., Bódai, T., and Tél, T. (2017). On the importance of the convergence to climate attractors. The European Physical Journal Special Topics, 226(9), 2031-2038.

Maher, N., Matei, D., Milinski, S., and Marotzke, J.: ENSO change in climate projections: forced response or internal variability?, Geophysical Research Letters, 45, 11–390, 2018.

Monahan, A. H., and Dai, A.: The spatial and temporal structure of ENSO nonlinearity. Journal of Climate, 17(15), 3026-3036, 2004.

Tél, T., Bódai, T., Drótos, G., Haszpra, T., Herein, M., Kaszás, B., and Vincze, M. (2019): The Theory of Parallel Climate Realizations – A New Framework of Ensemble Methods in a Changing Climate: An Overview. Journal of Statistical Physics (doi:10.1007/s10955-019-02445-7).

Change: For clarity, we have added the term “ensemble” before the “standard deviation of the PCs” at each occurence. Furthermore, for clarity, we have added to old line 116/new lines 134–136 that “The instantaneous strength of ENSO is computed as the ensemble standard deviation of the PC1s of the given time instant **as the snapshot counterpart of the temporal standard deviation of the PC1 used as a common practice to represent the strength of an oscillation in traditional EOF analysis (e.g., Monahan and Dai, 2004; Maher et al., 2018).**”

For an easier understanding of the merit of snapshot framework and SEOF analysis, a completely new Section, 2.3 is devoted to a detailed presentation of the capabilities of the snapshot methods compared to the traditional ones and to interpret the meaning of their results. It includes a discussion recalling that temporal statistics are meant to be evaluated for stationary time series only, whereas the snapshot methods can handle nonstationary processes as well.

2. The authors kept emphasizing that snapshot framework is better than the traditional temporal statistics method (e.g. L74-77, L231-235). However, the authors did not provide detailed explanations of the pros/cons of both methods, nor did they compare the similarities and discrepancies of the results from the two different methods. Were their results more reasonable (in terms of physics) compared to the ones using temporal statistics method?

I would think that using the time period says from 1900 to the present, it is feasible to compare the results from these two methods with the reanalysis data. By doing so, it would provide a more convincing evidence that the snapshot framework is a more suitable tool.

Change: In new Section 2.3 detailed explanations of the snapshot and temporal methods, and their pros/cons are presented. In the traditional temporal approach connections (and oscillation patterns, etc.) are treated as constant for a chosen time period (resulting, e.g., in a single value of correlation coefficient at each grid point for the time period for studying teleconnections). In contrast to this snapshot methods use only the information of the potential outcomes compatible with the climate states of the given time instant, without the direct impact of previous or future climate states on the value of the statistics. Therefore, the results obtained from snapshot methods are more reasonable in terms of physics.

Response: As Section 2.3 mentions, a comparison of results derived from snapshot methods and time series analysis can be found in Herein et al. (2017) and Bódai et al. (2019) on the example of the North Atlantic Oscillation teleconnections using a station-based NAO index and the ENSO phenomenon using the Niño3 és SOI indices. The single time series results were shown to be strongly different from the snapshot ones. These papers also illustrate by numerical examples that the choice of the time window may have a considerable effect on the statistical measures in the traditional approach, while this is not a problem when using the snapshot framework.

Bódai, T., Drótos, G., Herein, M., Lunkeit, F., and Lucarini, V. (2019). The forced response of the El Niño–Southern Oscillation-Indian monsoon teleconnection in ensembles of Earth System Models. Journal of Climate, https://doi.org/10.1175/JCLI-D-19-0341.1.

Herein, M., Drótos, G., Haszpra, T., Márfy, J., and Tél, T. (2017). The theory of parallel climate realizations as a new framework for teleconnection analysis. Scientific Reports, 7, 44529.

3. As noted in several recent studies (e.g. Seager et al. 2019 Nat. Clim. Change), in most of the state-of-the-art GCMs (including CMIP5), they have an El Nino-like trend in SST over the tropical Pacific in the warming climate, inconsistent with the observation (that is, increase in the west-east SST gradient -> La Nina-like trend in SST). Does this bias exist in the

CESM1? If so, would it affect the fidelity of the research (change in ENSO pattern in the warming climate) here?

Response: We thank the Referee for drawing our attention to the fact that the so-called Niño3.4 SST trend might affect the performance of the CESM-LE in capturing the ENSO pattern and its changes. The study suggested by the Referee (Seager et al. 2019) also includes results obtained for CESM-LE called the "National Center for Atmospheric Research (NCAR) Large Ensemble (LENS)" in the study (for name convention, see subsection "CMIP5 models and NCAR LENS" in section "Methods").

According to the paper, similarly to CMIP5 models, the ensemble mean of LENS also shows a moderate Niño3.4 trend over 60 years inconsistent with HadISST and NCEP/NCAR reanalysis, however, this trend proves to be smaller than the CMIP5 multimodel mean for the studied time interval of end years 2008–2017, and some of the ensemble members approach well the values derived from reanalysis. Furthermore, the ECMWF/ORAS4 reanalysis trend values are quite close to LENS ensemble mean for end years of 2008–2009.

The Niño3.4 trend may have an effect on the strength of and change in the teleconnections, however, since Section 3.2 proves that the results from CESM-LE obtained by SEOF analysis are roughly consistent with the observed teleconnections and the CESM-LE performs relatively well according to Seager et al. (2019), we expect that it does not influence much the strength and changes of the connections found in this study.

Seager, R., Cane, M., Henderson, N., Lee, D. E., Abernathey, R., and Zhang, H.: Strengthening tropical Pacific zonal sea surface temperature gradient consistent with rising greenhouse gases. *Nature Climate Change*, *9*(7), 517, 2019.

Change: In order to address this question, a discussion about the deviation in the SST trends in the reanalysis data and in CESM-LE has been added to the Conclusions in old line 231/in new line 354–365.

4. The correlation analysis in the section 3.2 did not really provide constructively new ideas. The correlation between ENSO SST anomalies and precipitation across the globe has been well-examined and established for decades. And the relationships from this manuscript (e.g. L165-169) are consistent with the previous literature. Therefore, the zero-lag correlation analysis in the current climate here seems to me only demonstrates that CESM1 and the snapshot framework can decently produce ENSO-related SST-precipitation relationships.

Also, the impacts of ENSO on precipitation (or say teleconnections) cannot be simplified by just examining correlation, especially for boreal summer season. ENSO can be at developing or decaying phases during boreal summer season. The teleconnection patterns and therefore impacts on regional precipitation can be quite different between these two phases. Moreover, El Nino and La Nina have asymmetric characteristics during the decaying phase: an El Nino tends to decay rapidly; while a La Nina tends to decay slowly and even persist into the following winter (e.g. Okumura and Deser 2010). In this context, the teleconnection patterns of El Nino and La Nina are not mirror images, which means, applying correlation analysis on JJAS variables might not be able to reflect the real impacts from El Nino and La Nina on teleconnections. And in this sense, the half-year-lag correlation conducted in this article did not reasonably consider the lifecycle of an ENSO event. https://journals.ametsoc.org/doi/full/10.1175/2010JCLI3592.1

As the sensitivity of seasonal precipitation over land depends strongly on the configuration and location of teleconnection patterns, I would suggest the authors to include the atmospheric circulation patterns when discussing the change in teleconnection patterns. The circulation patterns could also provide more intuitively physical sense that how the change in tropical SST modulates the large-scale atmospheric circulation and thereby precipitation over the remote area.

Response: As the Referee writes, Sec. 3.2 was not intended to provide new ideas, but rather to illustrate (1) how to apply the SEOF-derived PC1s for teleconnection analysis within the snapshot framework, and (2) to reveal the capability of the CESM-LE and the SEOF analysis regarding the ENSO teleconnections compared to the observations (similarly to what is done in Section 3.1 revealing the ENSO patterns and amplitudes in CESM-LE using SEOF). We feel that it is satisfying that these results are roughly consistent with the previous literature analyzing observation-based data. Furthermore, this section is also devoted to study the forced changes in the strength of teleconnections, which has not been done so far for ENSO teleconnections in the snapshot framework to the best of our knowledge.

Regardless of the asymmetric characteristics of the decaying or developing phase of El Niño and La Niña, PC1 characterizes the instantaneous phase of the ENSO. Although the connection with the corresponding PRECT, of course, can be quite different in different phases and could thus be described by more sophisticated techniques as well, a kind of leading-order characterization is also viable in terms of the correlation coefficient, and the strength of connection can be defined in this way. We note that this characterization is also used, e.g., by Krishna Kumar et al. (1999) and Ramu et al. (2018) between the Niño3/Niño3.4 index and precipitation, too. We agree with the Referee, however, that when one wishes to maximize predictability or the explanatory power, then further “dimensions” of the problem should be considered, which we feel could be a topic of further research.

Regarding the last paragraph of the question on atmospheric circulation patterns, we intended to devote this study to illustrate the applicability of the snapshot framework to the ENSO phenomenon, and to present alterations in the expected conditions by 2100 based on CESM-LE. We think that an overall and profound investigation of the reasons behind the observed changes would be an enormous project and could also be a topic of future research.

Krishna Kumar, K., Rajagopalan, B., and Cane, M. A.: On the weakening relationship between the Indian monsoon and ENSO. Science, 284(5423), 2156-2159, 1999.

Ramu, D.A., Chowdary, J.S., Ramakrishna, S.S.V.S., and Kumar, O. S. R. U. B.: Diversity in the representation of large-scale circulation associated with ENSO-Indian summer monsoon teleconnections in CMIP5 models. Theor. Appl. Climatol. 132. 1-2, 465–478, 2018.

5. The title says “On the time evolution of ENSO and its teleconnections in an ensemble view”. This title does not explicitly express that the focus of this paper is the change in ENSO under climate change scenario. Instead, “time evolution of ENSO” strongly misleads to the evolution of an ENSO life-cycle (from developing to peak to decaying phases…).

Change: Motivated by the Referee’s suggestion, we have changed the title to “Investigating ENSO and its teleconnections under climate change in an ensemble view – a new perspective”.

6. In general, as the authors deployed EOF analysis on all the ensemble members at each time step and compared the results from EOF analyses at different time steps. I would suggest that when mentioning variability, change or any analysis used in the article (e.g. linear fit), it would be beneficial to (explicitly) explain that it is over ensemble members or time steps.

Change: Thank you for your suggestion, we have added “over ensemble”/”ensemble-based” or “over time” at each of these occurrences.

7. The authors used “time instant” in this article, but I found this is really confusing. “Instant” gives people a mistaken impression that it means “an infinitesimal space of time”. I would suggest that time step is one of the possible alternatives. Or the authors could emphasize that “time instant” used here means seasonal average when “time instant” was mentioned the very first time in the article. Similarly, “instantaneous forcing” (e.g. L48) is also confusing. Is the forcing just turned on for a very short while?

Response: Thank you for drawing our attention to this misunderstable term.

Change: We have brought forward the relevant sentence from old line 106 to the first occurence of the term “time instant” in old line 37/in new line 39. This sentence has also been rephrased from “On a ``time instant'' we mean seasonal average: note that a season can be considered short, but the snapshot framework is also applicable for quantities evaluated over time intervals (Drótos et al., 2015)” to “We note that a ``time instant'' can also mean time averages over certain periods, because the snapshot framework is also applicable for quantities evaluated over time intervals (Drótos et al., 2015).”

The term “instantaneous forcing” has been changed to “the external forcing history up to that time”.

Minor comments

Introduction

1. L26: However, the model simulations of future ENSO changes diverge widely among climate models. & L36: To avoid the above-mentioned contradiction, in this study we present an ensemble-based analysis. My question is, how could the authors be sure that their method provided the right direction? (Similar to the 2nd major comment).

Response: As detailed in the answer for the 2nd major comment, the new Section 2.3 shows why ensemble-based snapshot methods are correct in terms of the physics characterizing the plethora of all potential outcomes compatible with the instantaneous climate states. The text “above-mentioned contradiction” referred to the paragraph just above this sentence, so it is about the disadvantages of using temporal statistics and not to address the problem of the large divergence of ENSO changes among climate models two paragraphs earlier.

Change: For clarity, “contradiction” is changed to “discrepancy of temporal methods”.

2. L39-41: Instead of just listing these papers, I would suggest the authors specify some topics that have been examined using large-ensemble when referring these papers.

Change: We have detailed the topics of these references in new lines 41–52. that have been examined using large-ensembles.

3. L55: “This approach”: what approach? Large ensemble? Or snapshot framework. Seems like it means “large-ensemble” based on the following context.

Change: Thank you for this remark, for clarity, we have changed “This approach” to “The snapshot framework, which can be applied numerically to large ensembles,”.

Data & Methods

1. Why use JJAS 4-month average compared to DJF 3-month average?

Response: As ENSO has its maximum around boreal winter, which is traditionally defined as DJF, we analyze the DJF ENSO pattern and ENSO teleconnections in the paper. In order to investigate the possibility of predicting precipitation half a year in advance based on PC1, we calculate lagged correlations beyond instantaneous ones. The relationship between ENSO and the South Asian monsoon is believed to be one of the most important teleconnection phenomena and is traditionally investigated using JJAS (see, e.g. Krishna Kumar et al. (1999), Ashok et al. (2007), Srivastava et al. (2019)), and West Africa also receives the major proportion of its annual rainfall in JJAS (Srivastava et al. (2019)), therefore, we chose JJAS. The choice of the 3-month long DJF season combined with the 4-month long JJAS season is also used by Wu et al. (2012) for studying the ENSO influences on Indian summer monsoon.

Ashok, K., Behera, S. K., Rao, S. A., Weng, H., and Yamagata, T. (2007). El Niño Modoki and its possible teleconnection. Journal of Geophysical Research: Oceans, 112(C11).

Krishna Kumar, K., Rajagopalan, B., and Cane, M. A. (1999). On the weakening relationship between the Indian monsoon and ENSO. *Science*, *284*(5423), 2156-2159.

Srivastava, G., Chakraborty, A., and Nanjundiah, R. S. (2019). Multidecadal see-saw of the impact of ENSO on Indian and West African summer monsoon rainfall. Climate dynamics, 52(11), 6633-6649.

Wu, R., Chen, J., and Chen, W. (2012). Different types of ENSO influences on the Indian summer monsoon variability. Journal of Climate, 25(3), 903-920.

Change: To clarify the choice of DJF and JJAS, we have added a short description about the above reasons in old line 124/in new lines 148–154.

2. L109: other way around? Consider leading SEOF mode as instantaneous ENSO loading pattern?

Change: Thank you for your remark. We have rephrased the sentence to “We consider the instantaneous **ensemble-based** leading SEOF mode **(by which we mean the normalized eigenvectors associated with the largest eigenvalue of the covariance matrix of the SST anomaly fields)** as the ENSO loading pattern, ...”

3. The authors mentioned Maher et al. 2018 several times (e.g. L105; L142), I am not sure all of them are necessary and provide useful information. As many readers might not read the paper before, so if the authors would like to include it, it would be better to provide more details why the authors need to compare them.

Response: We believe that emphasizing the comparison is important because they applied a similar but somewhat different technique, called EOF-E to analyze the ENSO phenomenon, as it is stated in old line 65/in new line 77. It is straightforward and natural that the results of the two methods are worth comparing, especially because these alternative propositions are very fresh.

Change: Where we first compare our results to those of Maher et al. (2018), in old line 142/in new line 237, we now indicate that the reason for comparison is the similarity of the EOF-E and SEOF analyses. (This has also been mentioned in the Introduction, already in the original manuscript.)

Results

1. L131: SST variability? SST anomalies?

Change: We have rephrased the sentence to "... the typical amplitudes of the SST anomaly values across the ensemble members at the Equatorial Pacific are somewhat larger in DJF...".

2. L150: the explained variance in JJAS is increased (Fig.3b) -> Does this mean ENSO pattern is more favorable in the future? If so, is this consistent with previous studies?

Response: The larger values of the explained variance mean that by 2100 the oscillation associated with the first mode is going to be responsible for a much larger fraction of the variability in the SST fields. We could not find any previous study about this finding.

Change: We have added this sentence in old line 152/in new line 260–267 to better explain the meaning of our results. This also includes a description of the changes in the higher modes.

3. Section 3.2: As mentioned in the major comments, JJAS could be during the developing or decaying phases among an ENSO life-cycle, it is important to specify the lag-relation. For example, it is well-known that the Indian Ocean has delayed response (that is during the decaying phase) to an El Nino.

Also, L188-203, it would be much more helpful if the authors could include the change in atmospheric circulations. This would provide more physical sense of how the atmosphere would change given the change in the tropical SST. Just listing the changes in precipitation over some random areas does not really provide essential information for readers to take away.

Response: In addition to our response to these two suggestions above, we would like to note that we did mean to give some indication that the “life cycle of the processes” involved does have a significance. This is why we considered lagged correlations, beside our intention to indicate predictability. However, we do suspect that the analysis framework provided by (lagged) correlations has its limits, such as – what the Referee pointed out – it should matter that it is a developing or decay phase of the El Niño (not just the value of a Niño index or PC1), or, the time lag could be varied in a range around zero to better resolve the phenomenon. However, such a methodology implies a large breadth of visuals to analyse, which is likely not a way to go in order to have a good understanding. Nevertheless, correlations are already very useful to evaluate, and doing this in an ensemble-based framework in order to detect the forced response of teleconnections is a very recent proposition, and, therefore, should not be considered trivial.

4. L202: we conclude that a half-year-forward estimate of the precipitation from PC1 data in these regions becomes “more accurate” -> this statement is not accurate. What did the authors mean “more accurate” (in terms of what? forecast?)? How did they assess the accuracy?

Response: The cited line is “The lagged correlations for DJF PC1 and JJAS PRECT (Fig. 5.c) are found to increase considerably near the eastern coast of Africa, in the Niño3 and Niño4 regions and around the Caribbean Islands. Thus, we conclude that a half-year-forward estimate of the precipitation from PC1 data in these regions becomes more accurate.”

It means that the correlation coefficient is larger, i.e., the relationship between them is stronger, i.e., there is “more chance” to predict the PRECT amount based on PC1 data than in a scenario of weaker correlations.

Change: For clarity, we added to the sentence that “Thus, **based on the larger value of the correlation coefficient implying a stronger relationship,** we conclude ...“

Conclusions

1. L213-215: Why are the changes in the ENSO pattern in JJAS season larger than in DJF season? Do the authors have any possible physical explanation of this seasonality difference?

Response: In general, a larger change in the different quantities is found for JJAS than for DJF. While at the beginning of the JJAS season the ENSO cycle is generally just switching phase in the CESM-LE (Wieners et al. 2019), DJF can be considered to be the “main” ENSO season with the largest SST anomalies. The smaller changes in the DJF quantities may be explained by the conjecture that, calculated for the main ENSO season, the DJF characteristics may be more robust and, thus, undergo weaker alterations during the investigated 150 years than the JJAS ones, which are calculated around the phase change of the cycle. A more thorough investigation of this question could be a topic of future research.

Wieners, C. E., Dijkstra, H. A., and de Ruijter, W. P. (2019). The interaction between the Western Indian Ocean and ENSO in CESM. Climate Dynamics, 52(9-10), 5153-5172.

Change: The above explanation has been added to the section Conclusion in new lines 337–342.

Figures

In general, the figures are not easy to read. For example, the authors could add titles to each panel. Also, the font size of all the labels are small.

Figure 4 is particularly difficult to read. The coastline contours are not clear. Also, they authors could consider to exclude the high latitude region. The differences between each color interval are not clear enough. It is really difficult to tell the differences. For me, it is just a bunch of red/blue patches. Also, since it is for precipitation, blue (red) might mislead to wetter (drier) condition, so I would suggest to adjust the color bar.

Response: Motivated by the Referee's remark, we have improved the figures.

Change: We have carried out the following changes on the figures:
- titles include the months, and in the case of correlation maps also the studied quantities have been added to each panel,
- the font size of the labels and axes has been enlarged,
- the color of the coastlines in each figure has been changed from gray to black and their line width is thicker now,
- for better visibility, the colorbar of the figures in Figs. 1-2 is changed for another one with more different red and blue shades,
- to better represent drier and wetter conditions, the colorbar of Figs. 4-5 is changed to a brown-green one,
- motivated by the question of SC1 about the sampling uncertainty vs. detectable changes, in all of the concerned figures the geographical locations where correlations or detected trends are significant at the traditionally computed 95% level are indicated.

We hope that these amendments and added discussion address the Referee's concerns.

Yours sincerely,

Tímea Haszpra, Mátyás Herein, Tamás Bódai