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Biogeosciences Discussions

Interactive comment on "Ecological research and large scale land-atmosphere feedbacks: lesson from the Bouchet's complementary relationship" *by* E. Lugato et al.

Anonymous Referee #1

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The study by **Lugato et al.** addresses quite an interesting and current topic regarding the on-going climate shifts. One of their objectives is to investigate the inter-annual variability and long-term trend of ETa on the Australian continent, which they theatrically try to provide evidence for their trends. Through their analysis, based on Bouchet's complementary (BC) relationship, they observed that results from plot manipulations of ETa should be treated with caution. They however, qualify the use of direct measurements (e.g. EC) in supporting and improving the quality of hydrological and land-atmosphere modeling. They conclude that no abrupt water cycle change has occurred in Australia in the last 35 yrs. They note that short-term fluctuations do occur, which may prove contradictory to the long-term trends. The period (1975-2009) over which the analysis

was performed is perfectly convincing for such kind of a study. It is a pity that a large part of their deductions is based on 1999-2009 results.

There are some critical shortcomings of this study.

1. The way this paper is written and presented makes it difficult to follow. Most sentences are long and ambiguous hence the readers cannot comprehend the contents. The language is inconsistent and require thorough edition.
2. The authors indicate that they acquired data from long-term climate stations, but how they integrate these plot measurements with the long-term climate records is not clear. There is need to clearly show how they connect the different data sources stated in the methodology section.
3. Data used to compare long-term records originate from three plots across Australia. There is no information regarding the long-term data records used in the final deductions. Although three stations were stated, most of the comparisons are done using data from single plots. The data is inadequate and not representative enough to describe the entire Australian continent as the authors try to suggest.
4. There is no clear message to be derived from the analyses. This likely stems from the fact that the work lacks a clear hypothesis. The use of CR as a valid analysis tool is recommended, but with no statistically valid proof. Most of the arguments are rather speculative.

Specific comments

Introduction

Pg. 6078

Ln 18. “Understanding spatial and temporal variability of the hydrological cycle to global change is a very di?cult task” The sentence is not making sense.

Ln 20“may have inter-annual variability more than an order of magnitude higher with respect to any trends larger than decades”. Sentence is not making sense.

Ln 21. “Land surface evaporation is likely the most uncertain parameter” compared to what?

Pg 6079.

Lns 4-5. It is not easy for readers to link this statement or observation to the general water cycle. Reducing water cycle to only precipitation and ETa is not right.

Pg 6080

Ln 9. Material should be “materials”.

The data provided for this analysis originate from only 3 climate stations

6082

In cases where you deal with very wet conditions, the assumptions of your CR model are not met. It is surprising that this is not captured in the results, which likely undermines the accuracy of your model.

The assumption provided for groundwater-driven transpiration is wrong. Moisture gradients during drought are too large and cannot be met by tree transpiration alone. Under such circumstances, it is expected that plants will respond by closing their stomata otherwise they will suffer from cavitation. Thus assuming that ETa=ETp is not valid. This assumption is also subject to the nature of vegetation and their distribution.

Ln 24. What is “driest” month in your case? What’s your scale here? When do you decide to start excluding the data? How did you determine the time when contribution from ground water becomes significant?

In Fig.3 please indicate the length of period for each data set. Figures are supposed to be self explanatory and one must not go back to the text to understand them. What monthly values are these, means, max. mins? Why so few data points for AU-How? Do they cover the period 1975-2009 as indicated on Pg 6083 Ln 21?

Pg 6083

Ln 2. “which/that” is missing at the end of this line.

Ln 21 “linear regression across the entire period indicated a slight, but not significant ($P > 0.05$), decrease” You should not consider this as a decrease as long as it is not significant.

Ln 22. Regression of what? Show the results of the regression, otherwise it only remains speculative?

Ln 25. Why not from 1975 as stated in the methods?

Pg 6084

Ln 4-7. If you consider the 1999-2009 in relation to the long-term data set Fig. 5, then this statement is not right. Over the long-term, there is an insignificant –ve trend in E_{pan}, as stated in second paragraph in the results section. This therefore, contradicts the conclusion drawn here. As shown by your statistical results from the long-term data, the annual fluctuations emphasized here are normal and are taken care of in the standard deviations. Since your study was based on long-term assessment of trends, it would oly be logical that you make deductions based on the long-term results.

Lns 16-18. not making sense. Re-write.

Ln 16 – 18, you state here that identifying causes of the change were not your objective, but this information is necessary in order to support your results. Otherwise how do you qualify the results? Just mentioning that E_{pan}has increased in Australia/some part of Australia over the last 10 years is not enough. This is why in the next lines, you try to

support your results but this only becomes speculative since you have no supporting data of your own.

Interactive comment on Biogeosciences Discuss., 8, 6077, 2011.