

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 #2

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1 General Comments

Lugato et al. uses the record of pan evaporation in order to compute the long-term record of actual evapotranspiration, ET_a , in Australia by using complementary relationship of Bouchet, and compares the results with eddy covariance measurements at AsiaFlux sites. As the long-term data of evapotranspiration is rarely available, an approach using pan evaporation has become common in the literature. The topic is of interest of the readers of this journal.

However, as described later, the manuscript is diverged than focused, contains many

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ambiguities and misinterpretations.

2 Specific Comments

p.6078 l.20, “variability more than ...” The latter part of this sentence is hard to understand.

Site selection: In this paper, 4 Fluxnet sites and the BoM pan evaporation measurements “closest” to each of the Fluxnet sites are subject to the analyses. However, as the climatic gradient is generally strong in some part of Australian continent, the distance between the Fluxnet site and the pan, that is at most 150 km, does not assure that both of them are within the same climatic zone. In fact, the numbers given in the text, such as 28% difference of precipitation and their correlation, $r = 0.88$, may suggest that they belong to slightly different climatic zones. As this links to an important basis of all the analyses in this manuscript, it is strongly recommended that the authors verify that each pair of the pan evaporation and the Fluxnet is truly under the same climate condition.

p.6081 l.10, “potential humidity index”: This word is defined, but not used elsewhere in this manuscript. The referee guesses that there is a fundamental lack of description around here.

p.6081 computation of ET_a : Computational method of ET_w is not fully described, and therefore ET_a presented in Figure 2 is ambiguous. This is **fatal**.

Fig. 3: The figure and the statistics in it are totally misleading. Quite different values of ET_a were observed and computed at the three BoM sites: For example, those at AU_How is about double of AU_Wac. These values are all merged to compute the regression line and the determination coefficient: This is a forged

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result. These statistics should be separately computed with each site. This will probably render totally different values, probably worse statistics with AU_How and AU_Wac. The reason for different performance with different sites should be subject to the discussion.

use of LPJ-DGVM: The authors' intention to apply the data to LPJ-DGVM is not clear with the current manuscript. As far as it is concerned with the topic of this paper, LPJ is not "a state of the art", as the formulations of evapotranspiration in LPJ are merely with medium complexity. Therefore, the comparison between CR results and LPJ does not mean anything.

3. Results and discussion: This is totally paradoxical discussion.

First, as an El Nino event lasts only shorter than a decade, it does not "affect" the trend of water cycle at time scale larger than a decade. It only affects the computed statistics, as well as increases its uncertainties, when an strongly anomalous event is included within the period in question. For these reason, the regression lines indicated by the red and the blue lines in Fig. 5 are thought to be artificial.

Second, the global trend may agree with a local trend, and may not, as there can be large regional differences. Therefore, the current results should not be discussed in connection with the results at global scale given in Syed et al.(2010) and Jung et al. (2010).

Third, the negative correlation between P and E_{pan} shown in Fig. 5 can be also explained by possible decrease in the solar radiation associated with larger P causing decrease in E_{pan} .

Forth, this section has a different approach from the previous section: though it is not explicitly stated the authors seems to have computed the area average of P and E_{pan} over Australia. As a point scale measurement and the continental

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average, in general, may have different behavior, this section does not support the work done in the previous sections.

For these reason, it is clear that this section does not prove anything and only visited different topics from the previous sections.

p.6084 l.15: This paragraph is not understandable.

3 Technical Correction

p.6079 l. 9 "Plot experiments causing ..." This should be something like "Plot experiments altering the external condition to cause ET_a variation are ... to help improve understanding of physical basis."

Fig. 3: The both axes do not have units. The axis labels should be, "eddy covariance method" and "complimentary relationship", for example.

p.6084 l.1 "ET_p": should be " E_{pan} "

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