Biogeosciences

Discussions

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Interactive comment on "Responses of energy partitioning and surface resistance to drought in a poplar plantation in northern China" *by* M. Kang et al.

Anonymous Referee #1

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-Overall-

The article titled "Responses of energy partitioning and surface resistance to drought in a poplar plantation in northern China" document the directly measured four-year energy and water fluxes from eddy covariance flux tower in order to assess sustainability of the poplar plantation. The topic of this research, sustainability of poplar plantations, is very important and the four-year data from flux tower and the other data from supplementary measurements are very valuable. The fluxes and indices from the data are well documented in the paper, so the paper is valuable as documentation of long-term energy and water fluxes measurement for poplar plantation. However, I think the authors fail to assess sustainability of the poplar plantation using their fluxes and in-

dices. The authors' main results are that the evaporative fraction decreased in the dry years due to decrease of surface resistance (Rs), Rs is the major controlling factor of evapotranspiration and energy partitioning for the site. Those results are well-known textbook facts for forest ecosystems and there is only difference (or uniqueness) in number. There is a gap between their results and conclusion in the paper. The authors compare their indices (apple) with those of the other forests ecosystem located in different climate from the previous researches (orange) and conclude that the forest ecosystem is not sustainable because their indices are higher (or lower). The authors show many interesting figures of the relationship between indices, but those does not directly explain the sustainability of the poplar plantation. Flux data is very precious, but it is common now and hard to publish the paper which just reports the number of data, especially in top journals like Biogeosciences.

-General comments-

In the introduction, write a review of sustainability index for ecosystem (or how to assess sustainability for ecosystem). And, introduce the sustainability index which you will use (or how will you assess the sustainability) in the paper.

In the methods, write how the indices (Rs, LE/LEeq, beta and Omega) are related to the ecosystem sustainability, or explain the sustainability index which is introduced in the introduction or the methodology which can assess the sustainability properly in this study case.

In the quantification of surface energy balance, the storage term is important, especially for forest ecosystems (e.g., Leuning et al., 2012). Estimate the storage term and add the result.

I recommend to analyze four components of radiation (i.e., incoming/outgoing short-wave/longwave radiation), if the data from CNR1 is available. I think radiative energy balance is very important to assess surface energy balance. The authors only show net radiation (i.e., sum of the four components). The author can find the differences

of radiative energy balance between the dry and wet years such that the outgoing longwave radiation is higher in the dry year than that in the wet year.

The authors have LAI data. I recommend normalizing Rs using LAI (i.e., Rs per unit leaf area). It guarantees to evaluate more clear response of Rs to drought.

In the discussion, explain which ecosystem is sustainable ecosystem. For example, an ecosystem which water loss equal to water supply is sustainable or an ecosystem which vegetation can survive in drought is sustainable or an ecosystem which surface resistance is not sensitive to drought is sustainable. And, explain why the authors argue that. Currently, it is hard to know how the authors assess the ecosystem sustainability. I guess the authors may argue that the higher Rs, beta and Omega is the less sustainability. It is hard to be acceptable without additional explanation.

Everyone knows that Rs, beta and Omega for an ecosystem under water stress is higher than that under normal condition. But, the authors compare Rs, beta and Omega between the study site and the others, without explanation of water stress status of the sites. I recommend to find the reported Rs, beta and Omega for ecosystems in (semi) arid region, and compare those with the indices for the study site.

-Specifics-

Line 12, page 350: present –> presented

Line 18, page 352: The correction method of Burba et al. (2008) can be applied to the case a sensor LI-7500 is installed perpendicularly. Write how the sensor is installed.

Line 24, page 352: The friction velocity threshold method is also applied to the latent/sensible heat flux? If not, eliminate the explanation of friction velocity correction for CO_2 flux during nighttime.

Line 19-21, page 355: The sentence, "Lower or higher…" should move to the next paragraph.

Line 8, page 363: (Noormets et al., 2008) –> (e.g., Noormets et al., 2008)

Figure 2, 3, 4, and 5: Unify the ranges of x axis (DOY). Use running mean average for time series data. After applying running mean, it will be easier to distinguish the differences of seasonalities of time series.