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## ***Interactive comment on “Influence of the Asian Monsoon on net ecosystem carbon exchange in two major plant functional types in Korea” by H. Kwon et al.***

### **Anonymous Referee #2**

Received and published: 4 January 2010

#### General:

The Authors present a manuscript on an interesting flux study in two Korean sites, where they show anomalies of NEE during phases with high intensity rainfalls and low radiation. The study follows another study of a shorter period from the two investigated sites (Kwon et al. 2009), which found similar results: Low radiation during high intensity rain fall periods coincide with reduced GPP and NEE. The agricultural site shows less distinct effects, because management effects partly override the effects of the wet season.

The authors need to make clearer how the objectives of this study differ from Kwon et

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al. 2009 and concentrate on the new aspects. Currently I see a large overlap.

The paper stays mainly descriptive, i.e. it shows time series of NEE, GPP and RE together with meteorological variables. The analysis is then based on coincidences from looking at the graphs. I wonder if this was all one could do to reveal major effects? The Authors mention that a lot more environmental influences on NEE (GPP and RE) can be expected, it would be interesting to learn, how they were able to exclude so many factors and found radiation to be the most significant effect (which I don't doubt, looking at the graphs).

Both sites are complex for micrometeorological measurements. The footprint of the cropland measurement consists of a number of land use types, of which the authors select cropland and rice paddy as representative for the footprint. The Authors do not show, how they excluded the influences of the many other land covers (urban) from the data set. But even if they accept that these systems bias the measurements, I doubt that the two systems, rice paddy and cropland ("a different patch of various land use"), are that comparable to treat them in one data set / one discussion. Would it be possible to separate the data set into either rice paddy or cropland? What is the effect of the rolling terrain on the measurements on the GDK site? How large is the fetch around the tower?

I don't see the energy balance (EB) data used very much for data quality assessment of the CO<sub>2</sub> fluxes. If it is only used to say that one has measured closure in an order of magnitude as others did, too, one could just leave it with this sentence. But wouldn't it be more interesting using it to distinguish data quality between the sites and seasons? When did EB show deficiencies?

The conclusions are yet too broad and thus too unrelated to the study. I wonder, if the Authors could give examples on how both scientists and policymakers can use the presented study to better 'appreciate' the sensitive couplings between land and water, between the carbon cycle and the hydrological cycle, and between the integrated

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ecosystem management and climate change? Make clear what you suggest beyond 'appreciation'.

At the current state the analysis and conclusions are, given the quality of the data set, yet too superficial. It is not yet clear what we learned from the extended study as opposed to what was already said in a previously published paper using a shorter observation period.

Details:

Title

The use of the term 'ecosystem exchange in two major plant functional types' doesn't make sense to me. A plant functional type characterizes a plant and not a land-cover. An ecosystem exchange in a plant doesn't make sense. Please help me to understand this wording.

Abstract

Consider (10280,2 and 10282,9): The use of the phrase feedback loop doesn't fit the usual meaning (see common definitions feedback and feedback loop). A feedback loop happens in a system of elements and processes that are interconnected. The carbon balance doesn't affect precipitation, does it? I can't see circularity.

Reword (10280,2): 'Eddy covariance fluxes' are turbulent fluxes, measured with the eddy covariance method.

Introduction

Reword (10281,4): The Asian continent 'consists of ' – 'is covered' or hosts but not 'consists of'

Replace (10281,10): 'on' by 'for'

Make clear that this study is based on exactly the same sites as Kwon et al. (2009)

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used. Describe the new objectives and focus on them. At the moment the conclusions are very similar to what was already published for that site.

Explain (10283,15+): Why has measured data been excluded? What was the difference in coverage? And why has the measured data not at least be compared with the data from the other years?

## Methods

Comment on (10283,23) GDK complex terrain - what is the extension of the fetch? How do you deal with advection in calm nights? Which averaging time did you use to define the sectorial rotation angles?

Correct (10284,7): The term footprint has a different meaning than just surrounding area.

Correct: (10284,10): 'covering with'

Explain (10284,11): What is the nature of the terrain around the tower? The same as that of the entire region?

(10286,14): Why didn't you use the profile system to calculate the storage change?

(10286,21): Compare the different approaches and quantify the systematic bias caused by the choice of the approach in your study. The temperature of what (air, soil, vegetation) did you use to extrapolate from night to day? Give the values and accuracy of the parameters of the temperature response functions. Please justify, why you used 20 days for the one site and 32 for the other?

The gap-filling procedure is documented very well. I sit suited to define the gap filling error in value scarce periods (i.e. rainy periods measured with open path sensors).

(10287,21) What is the difference between the 'Energy budget closure' and the 'energy balance ratio'? How was  $R_n$  measured?

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Has the Burba Correction been applied? If not, why? What is the associated uncertainty?

## Results

Explain (10289,7-8): a) What do you mean with 'consistent' rainfall (uniform?) b) Why is the rainfall the reason for reduced PAI? What about storms?

Explain (10289,9): How did you correct the maximum summer PAI with the winter PAI?

Reword (10290,4): It's not the peak (=maximum value) that has this contribution to the annual sum.

Correct (10290,23): Theses

Extend(Fig. 6): Could you graphically indicate management activities in the Figure?

## Discussion

Clarify (10291,15): It sounds, as if you assume that reduced Rg is the direct reason for reduced GPP and NEE during Changma. Which evidence do you have for this? Which other factors could be relevant but aren't for what reason?

Reword (10291,18-19) " In 2008, the weakened mid-season depression brought the forest back to a moderate carbon sink."

Clarify (10292,10-13): What did Aubinet find out and how was it related to your findings?

Analyse (10293,5-20): I miss a more rigid analysis. Why can't you just simply show, if there is an effect of temperature on RE and how big the effect of reduced Rg on GPP is? The same with soil water, LAI / storm etc.? The gap filling is of course an important point. In the methods section it was said that the gap filling associated error has been estimated. What do these results tell on the error due to lack of data during rainy periods? At the end of this discussion the reader would rather expect a ranking

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of the effects based on data analysis than only a list of possible explanations.

Correct (10293, 24) 'or' -> 'for'

Insert (10294,4) 'diameter' before growth.

Shift (10295, 8-10) This can not be part of the summary, because it wasn't mentioned before. It would certainly fit better to the discussion part that compares the results from the two sites with other sites. Maybe together with this the low NEE can be discussed in terms of disturbance or fertility?

Which conclusions can you draw from your study beyond the ones Kwon et al. (2009) was already able to draw?

Sharpen conclusions from your study (10295,11-19): These sentences are too general and not clearly related to your study. What did your study actually tell , e.g., about land-water interactions etc.? Which impact would the projected shifts in Asian monsoon have on the carbon cycle according to your study?

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Interactive comment on Biogeosciences Discuss., 6, 10279, 2009.

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