

Interactive
Comment

Interactive comment on “Simultaneous measurements of CO₂ and water exchanges over three agroecosystems in South-West France” by P. Stella et al.

P. Stella et al.

Received and published: 21 August 2009

We thank the reviewer for his valuable comments and suggested corrections, especially concerning Section 3.2. We hope that the changes carried out in the text improve the quality and clarity of the discussion.

Replies to comments:

Reviewer:

There are three significant issues I have with the manuscript.

1. First, the open-path LI7500 measurements at LeBray and Bilos do not include any information on the heating error correction which is a significant problem with this sen-

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sor. Over the winter, we have found the sensor to have an error in cumulative NEE up to 100 g C m⁻² when compared to a closed-path system (two systems using the same sonic anemometer). During the daytime, it looks as if there is photosynthesis when in fact the field is void of living vegetation. This correction will not have a minor impact during the growing season GPP and Re but a substantial impact on non-growing season Re. Information on this correction can be obtained from the Licor website. This is an important correction and cannot be ignored.

Answer:

In the revised version, heating error corrections have been applied following Burba et al. (2008). We give below the values of annual accumulated NEE, GPP and Re of the two forests without and with those corrections.

Le Bray:

Without correction: NEE = 340, GPP = 1880, Re = 1540

With correction: NEE = 210, GPP = 1820, Re = 1610

Bilos:

Without correction: NEE = 525, GPP = 2005, Re = 1480

With correction: NEE = 335, GPP = 1950, Re = 1615

References:

Burba, G.G., McDermitt, D.K., Grelle, A., Anderson, D.J., Xu, L.: Addressing the influence of instrument surface heat exchange on the measurements of CO₂ flux from open-path gas analyzers, *Global Change Biol.*, 14, 1854-1876, 2008.

Reviewer:

2.a. The measurement period is only 11 months and the results are being compared to 12 month accumulations periods in other studies.

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2.b. There is also no mention of carbon removed from grain harvest in the maize field. This information is important to get a true sense of the annual carbon exchange.

Answer:

2.a. In fact, data from before and after this period of 11 months are available for the two forest sites, which were part of the CarboEurope-IP network. It is only for the agricultural site, instrumented only during the Regional Experiment campaign, that the measurement period was limited to 11 months, for technical reasons. In the revised version of the paper, we have included data from March 2007 at Bilos and Le Bray. To compare the carbon balance of the three sites over 12 months we had to estimate NEE, GPP and Re for the agricultural field. Since the field was devoid of vegetation in March 2007, $GPP = 0$ and $NEE = Re$ in this case. Therefore, the problem was only to estimate $NEE = Re$ in March, which has been done by extrapolating the slope of values from the first week of April (Figs. 9a and 9c).

2.b. See answers to Reviewer 1 who also raised this question.

Reviewer:

3. Finally, the discussion showing the reduction in GPP during the dry period and control of VPD is not very clear at all. Just showing diurnal patterns is far too qualitative. It needs to be more quantitative. You have to show relationships between parameters to quantify the impact. For example, show midday GPP plotted against midday PPFD for days with low midday VPD and on days with high VPD or show one day of GPP vs PPFD on a day with good moisture compared to a day with low soil moisture. This allows the reader to quantify the impact of dry conditions.

Answer:

We totally agree with the reviewer and have added in the revised version a new figure (Fig. 3: GPP/FPP vs VPD for the three sites) which allows the reader to understand the behaviour of the three ecosystems observed on time series. Consequently, Section

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3.2 has been totally rephrased.

Reviewer:

4. One smaller item, WUE calculated on a growing season basis is also interesting information to present to readers, especially since WUE using GPP in agricultural crops is not as common as using biomass or yield. It does contain valuable information nonetheless. WUE is defined as the ratio of growing season GPP to growing season ET.

Answer:

We do not understand the comment from the reviewer since we precisely gave the maize WUE for the growing season. Indeed, we wrote: "For the two pine forests, mean WUE, over the whole year, is identical at both sites (about 5 mmol CO₂ mol H₂O⁻¹)."

and "Over the whole growing season, WUE of the agricultural field is about 8 mmol CO₂ mol H₂O⁻¹." To make things clearer, we have added in the revised version the value of WUE of the agricultural field over the whole period of analysis (4.5 mmol CO₂ mol H₂O⁻¹).

Interactive comment on Biogeosciences Discuss., 6, 2489, 2009.

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