

Interactive comment on “Carbon dioxide fluxes over an ancient broadleaved deciduous woodland in southern England” by M. V. Thomas et al.

Anonymous Referee #3

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General comments:

The paper presents results of two years of eddy covariance measured fluxes of Cow over a temperate broadleaved deciduous forest. The net ecosystem productivity derived from the measured fluxes compares well with estimates in a companion paper of net primary productivity and respiration. The paper tries to relate the fluxes to major meteorological drivers and also try to explain the interannual variation. The results from the paper are put into a broader context by comparison with other studies in similar ecosystems.

In general, I find that the study gives valuable information and a substantial amount of analysis has been applied to the data. The presentation can be improved. Especially, I would like to see a more detailed description of the site and set-up than given here. The

meteorological measurements have been made a substantial distance away from the flux mast and in a different ecosystem. This calls for some careful consideration when interpreting the fluxes in relation to meteorology. I have some reservations regarding the methodology as detailed below and also find that it is a bit brave to talk about interannual variability based on only two years of data. Other studies with more years have concluded that it is very difficult to derive simple meteorological explanations of the net carbon uptake in a single year.

Specific comments:

p. 3770, l.20: The flux measurements were made at a height of 25m. No information is given on the height of the trees, but I suspect that the trees of such an old forest can easily be very close to this in height. Please add more detailed information on this and possibly also about the variation in tree height and topography.

p. 3771, l.14: It seems from the text that the only instrumentation on the mast is a sonic and open path LiCor. All other meteorological measurements were measured 840m away and no details are given. How and where e.g. was net radiation measured?

p. 3771, l. 25: “standard corrections for open path sensors”: Please specify what these are.

p.3772: Secondary data processing: The description of the procedures to clean up the data needs clarification. It is well known, that open path sensors perform poorly in moist conditions and that a special correction is needed (“Burba correction”) to avoid false fluxes under certain meteorological conditions. The procedures laid out here seem to be somewhat subjective. A small table giving each criteria and the percentage of data removed would be helpful. The removal of negative night time fluxes seems a little bit risky to me and calls for a more serious analysis. Ideally there should be no photosynthesis in the dark and thus no CO₂ uptake. However, if the negative values are just results of noise in the measurement system, similarly small positive fluxes should be removed. Otherwise the results will be biased.

p.3775, l.11: A very high percentage of the data has to be gap-filled. Here we are told that 32.5% of the data has to be filled, but after u^* correction this increases to 43% (p. 3780, l. 3). This is a very high percentage of gap-filling and I miss some discussion on the impact of this on the reliability of the annual sums of NEE etc.

p. 3778, l.9: As noted above the meteorological data are not measured at the site of the flux measurements. Here we are informed that it is not even in the forest but in open grassland. What does this mean to the calculation of ecosystem respiration (based on soil temperature) and to the derived conclusions regarding meteorological influence on the fluxes.

p. 3779, l. 24: The diurnal variation in respiration can be substantial due to temperature differences. Here this variation is assumed to be “small”. How small?

p. 3781, l. 7: Here we are told that the flux tower is on a hill. This is important information that should have been given in the Methodology section.

p.3784, l. 19: I suppose that the study actually gave two complete years of measurements. Whether they are calendar years does not really matter. It is true that many by convention report fluxes for calendar years, but really not necessary.

Figure 9: Since there are no clear relationships between the cumulated ecosystem fluxes and the average precipitation and temperature this figure does not add information over that given in Table 3 and could be left out.

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