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The authors would like to thank the referee for his time and valuable comments, which we address below. The referee's comments are shown in *italics* whilst our response is in normal type.

Referee comment
The paper addresses relevant scientific questions within the scope of BG. It presents an account of the function of a well known research site over 12 years. Whilst some of this data has been presented elsewhere, the value of this paper is in its exploration of the environmental and other controls on the variability of productivity viewed over the medium term.

Author response
We are pleased to note that the referee feels that this paper is relevant to BG. Although it is true that a small part of this dataset has been presented elsewhere (e.g. Read et al. 2009), and used in some international site comparisons (e.g. Groenendijk et al. 2011), this has been restricted to C flux data from a few years. This paper is therefore the first time that a full analysis has been conducted of the complete 12 years of C flux data with associated environmental drivers and certainly the first time it has been presented for peer review, with a full description of the site.

Referee comment
Substantial conclusions are reached, specifically that some interannual variability in ecosystem scale productivity can be linked to particular weather (for example) events, whilst other aspects of climatic variability (for instance variation in precipitation) appeared a less important driver.

More could possibly be made to investigate the relative importance of the various contributing drivers of variability, providing a type of sensitivity analysis in an observational setting, basing these within a physiological context.

For example, the relationship between ecosystem respiration (Reco) and soil moisture is shown to be largely conserved through the whole observation period, but no discussion is made about what processes this relationship might result from – this is important because Reco is not itself measured directly, but derived from the observed data, constrained by environmental drivers some of which may themselves be correlated with soil moisture. If soil moisture content were an important driver of some ecosystem-scale physiological processes, would this signal not also be observed in, for example, GPP? GPP is shown to be well correlated with LAI (i.e. fig. 8), but it would be interesting to see is how the residual variation could be explained by other environmental drivers – this dataset provides and excellent opportunity to probe this question further.

Author response
We agree that a more detailed analysis and investigation would be useful and aid in the interpretation of the results. Therefore, in the revised manuscript we have split Reco between growing season and non-growing season and, in doing so have been able to refine our analysis, and we have given a more detailed explanation of the environmental drivers, and suggested processes involved.

Referee comment
An interesting point that could be explored further is that the CV of NEP is large compared to its components (GPP and Reco). This highlights that fact that variations in the two partial processes are not coherent over the annual timescale, even though both are declining at the decadal timescale.

Author response

This comment by the referee has pointed up a problem with using CV to compare variation with measures on interval scales such as GPP , Reco and NEP, because CV depends on the size of the mean, (e.g. in some situations NEP might approach zero, and thus CV tend to a very large value). Arguably, for C balance assessment it is the absolute variation that matters, this is lower for NEP than GPP or Reco, because of the observed partial coherence between the latter two (see original Figure 7). All reference to CV in relation to these parameters has been removed from the revised ms and we have restricted discussion on variability to absolute measures.

Referee comment

This long term decline [in GPP etc] also merits further consideration – how important are the two insect-impacted years to the significance of this long term decline?

Author response

Further analysis has revealed that the insect impacted years did not have a statistically significant effect on the slope of the relationship between year and GPP, Reco or NEP. We have included more detail on these trends in the revised ms.

Referee comment

The scientific methods and assumptions are valid and clearly outlined.
The results are sufficient to support the interpretations and conclusions.
The description of experiments and calculations are sufficiently complete and precise to allow their reproduction by fellow scientists (given sufficient time & resources!)
The authors give proper credit to related work and clearly indicate their own new/original contribution.
The title and abstract clearly reflect the contents of the paper & provide a concise and complete summary
The overall presentation is well structured and clear, the language is fluent and precise, mathematical formulae, symbols, abbreviations, and units are correctly defined and used.
No parts of the paper (text, formulae, figures, tables) need to be clarified, reduced, combined, or eliminated.
The number and quality of references are appropriate. No supplementary material is indicated.

Author response

We are pleased to note that that the referee feels that all of these technical aspects have been dealt with correctly.

Referee comment

Technical corrections
Page 9676, Line 18: Replace "NEP was assumed to be opposite: : :", with "By convention, NEP was defined as opposite: : :"
Table 5 – SEM and SD of r2 has no meaning, so remove from table.

Author response

These corrections have been incorporated into the revised manuscript; thank you.

References

Groenendijk, M., Dolman, A.J., van der Molen, M.K., Leuning, R., Arneth, A., Delpierre, N., Gash, J.H.C., Lindroth, A., Richardson, A.D., Verbeeck,H., and Wohlfahrt, G.: Assessing parameter variability in a photosynthesis model within and between plant functional types using global Fluxnet eddy covariance data, Agr.Forest Meteorol.,151,1, 22-38, 2011.

Read, D.J., Freer-Smith, P.H., Morison, J.I.L., Hanley, N., West, C.C and Snowdon, P. (eds). 2009. Combating climate change – a role for UK forest. An assessment of the potential of the UK's trees and woodlands to mitigate and adapt to climate change. The Stationery Office, Edinburgh.