

## ***Interactive comment on “Competing roles of rising CO<sub>2</sub> and climate change in the contemporary European carbon balance” by R. Harrison and C. Jones***

**R. Harrison and C. Jones**

Received and published: 5 November 2007

We are now ready to resubmit our version of the manuscript 'Competing roles of rising CO<sub>2</sub> and climate change in the contemporary European carbon balance', which has benefited by consideration of the reviewer's comments we received. The manuscript has been much improved, and we thank the reviewers for their thoughtful comments. To receive 4 such positive reviews was very encouraging. We have also received considerable help with both the paper revisions and extra analysis and also in some new simulations from John Hughes, and so his name has been added to the author list.

Our responses to your comments are as described below (reviewer's comments in

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italics). The changes are often very minor, but where we have made a significant change we have described what we have added.

*The manuscript is concise and well organized. However, this manuscript does not describe how JULES was validated (except for the hydrology using GSWP2 in Discussion). As many flux measurement data are available in Europe, it is possible and necessary to make comparison between flux observation and JULES output.*

JULES is not a new model, but a new name for an existing model - the Met Office land surface scheme, MOSES, with the TRIFFID DGVM vegetation model. These components have been used extensively, and validated in the literature in terms of large scale, and long-term carbon balance (which is the main focus of this paper). Discussion of this is now added to the experimental design (sec 2), which has been expanded to describe the origins , processes and validation of JULES.

*Page 2386 Abstract Line 8 Provide the period for the net increase of around 150 Tg C yr-1. Done.*

*Page 2387 Line 9 A recent paper (Stephens et al. 2007: Science 316, 1732-1735) implies that northern carbon sink is weaker and tropical sink is stronger than expected.*

This paper backs up our point, and is now noted.

*Page 2389 Line 1 If JULES includes TRIFFID DGVM, biome re-distribution occurred in the model simulation from 1948 to 2005. It is correct?*

No - as was already explained in the experimental design. We now make it clearer that this component is disabled for these simulations, and we use simply static, prescribed, present-day land cover.

*Page 2389 Line 2 Which spatial resolution was adopted in this study?*

1 degree 8211; this is now explicitly mentioned.

*Page 2389 Lines 10-18 Does JULES include response mechanisms to elevated CO2*

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*such as stomatal closure and enzymatic photosynthesis enhancement? If so, describing the model responsiveness may help readers to interpret the results (e.g., Page 2394 Line 1).*

JULES is a complex process based model. Discussion of the underlying process equations is in Cox et al 1998. This is now discussed in the extended experimental design section, and recent advances to the mechanisms of canopy radiation are also described.

*Page 2390 Line 6 In Figure 1, anomaly in 2003 is not evident. Correct? Then, why?*

The 2003 anomaly was centred over Western Europe (as discussed in some detail in Vetter et al), and to some extent was countered by an opposite anomaly in the East, leading to a smaller signal at a Europe-wide level. The Vetter et al paper also discusses that JULES is less sensitive to the anomaly than other models. Why this is remains unknown, but is actively being researched. This is now explained.

*Page 2393 Lines 7-9 The difference in sinks among the sub-regions is, at least partly due to the different in land area. Area-average strength may be clearer.*

Done

*Page 2394 Line 11 Why increased productivity did not result in biomass increment?*

We have added a discussion on the model's responses of carbon storage in its different pools

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Interactive comment on Biogeosciences Discuss., 4, 2385, 2007.

**BGD**

4, S1816–S1818, 2007

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