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Biogeosciences Discussions

Interactive comment on "Competing roles of rising CO_2 and climate change inthe contemporary European carbon balance" *by* R. Harrison and C. Jones

Anonymous Referee #4

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General comments:

This paper attempts to quantify the contributions of the increasing atmospheric CO2 and changing climate on the contemporary European ecosystem using a land-surface and carbon cycle model, JULES. The simulations include natural ecosystems with historical atmospheric CO2 and climate information. It is concluded that the CO2 fertilization effect is dominant in net increase of the European carbon storage, while the climate impact is to decrease the ability of Europe to storage the carbon.

The method used is very straightforward, basically following the experimental design of Vetter et al. (2007). The authors well refer the relevant studies, to give the background

of their study and to discuss their results. But the paper would need to present the results in more quantitative way. For example, the regions could be subdivided by major ecosystem types, such as, south Europe (Mediterranean ecosystem), and then the statistical differences of regional responses to climate and raising CO2 might be shown clearly and discussed more quantitatively

Overall, this paper presents some potentially interesting findings, but the paper might be improved with more statistical analysis. Otherwise the impact of this work will be very limited.

Specific comments:

- In Figure 1, "1980-2000" of the caption should be "1980-2005". To compare with the following results and discussions, it would be helpful if annual "total" European NEP [TgC/year] is presented, not annual "mean" NEP [gC/m/day].

- Page 2390 Line 10-13: In Figure 1, "Climate and CO2" simulation result shows the positive NEP, net uptake by the biosphere, for most of times, even for 2003. It seems that JULES does not respond so strongly to the extreme climate event of 2003. Vetter et al. (2007)'s analysis has been focussed on the growing season effect alone, but I was wondering whether the annual JULES-NEP for 2003 is consistent with the results presented in Vetter et al. (2007). The relationship the statement about the extreme hot summer 2003 in the text and the result presented in Figure 1 is not clear.

- Page 2391 Line 1-5: Are the carbon fluxes of 75 [TgC/year] for West Europe and 15 [Tg C/year] for East Europe averaged values over 1980-2005? It needs to explain how to take statistics and it would better to give standard deviations of these averages, instead of giving "approximate" values.

- In Figure 3, it is not easy to distinguish the differences of seasonal fluxes between 80s, 90s and 00s. This figure needs to emphasize the decadal change in seasonal biospheric fluxes. Also the unit of the plots should be added. Since the annual NEP

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varies largely from year to year (Fig. 1), the seasonal biospheric fluxes may also have large inter-annual variability. So I wonder how significant the decadal changes in the seasonal bisopheric fluxes are.

- Page 2391 Line 14: "An earlier autumn" should be given some explanation and references to support.

- Page 2391 Line 19-20: The authors mention the limitation of the phenology of JULES. How does JULES calculate the phenology?

- Page 2392 Line 26-29: The authors conclude here that "in the absence of any other factors than changing climate European land surface would be a source of about 174 TgC/year,... European carbon sink would be stronger in the absence of climate change". This paragraph is confusing. I suggest this should be stated after Figure 4 is presented, or the average NEP should be plotted in Fig. 1, and explained earlier in this section. Otherwise, readers might wonder where this number comes from. And does "the absence of climate change" mean "only CO2 fertilization effect"? At this point, how can the authors draw this conclusion? The results with the CO2 effect is presented and discussed in the next section.

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