

## ***Interactive comment on “Interactions between nitrogen deposition, land cover conversion, and climate change determine the contemporary carbon balance of Europe” by G. Churkina et al.***

**Anonymous Referee #2**

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This paper describes the contemporary terrestrial carbon balance of Europe based on the results of four different processed based ecosystem models. Such calculations have been presented before, but this analysis is different, because it analyzes the relative contribution of different environmental factors to the European terrestrial carbon sources and sinks over the 20th century. The subject matter is potentially important and some of the model results discussed, although not terribly exciting, are probably of interested to the readers of the Biogeosciences. The paper is fairly well organized, not excessively long or obscure in anyway. The abstract, tables and figures are useful and well done. I believe the paper is publishable, but would like to make following comments:

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### Major Comments:

(1) I have no doubt the modeling is carefully done, but the authors need to give some explanations about why there are such large differences between different model results. For example, figure 3 shows that the net land atmospheric flux based on four different models vary between 20-100 TgC/yr, but there are big differences between different model results for individual environmental factors.

(2) It is not clear why BIOME-BGC and O-CN models use land use maps for 2000 and 1999s for the 1700 equilibrium run, whereas two other models use year 1700 map. The input data should be the same for the model intercomparison studies. What justification is there for these different assumptions for different models?

### Minor Comments:

Abstract, Line 7: Change 'have increase' to 'have increased'. Abstract, line 12: Is 100 TgC/yr averaged for all models? Why have you picked the time-period 1980-2007? In the text, figures and tables, most of the results are discussed for the period 1951-2000.

Page 2234, line 16-17: MCRU data is available starting 1861. What source of data has been used for the period 1700-1860?

Page 2234, line 26: What is the resolution of national-level data?

Page 2240, Lines 1-2: It is stated that “Models with N cycle simulated very small net carbon uptake”. WHY? This statement needs an accompanying explanation.

Page 2241, Lines 6-7: It is stated that more C is accumulated in vegetation than in soil? It should be other way around based on the numbers cited?

Page 2242, Lines 2242: I disagree with the statement that “The ensemble average estimate of net carbon uptake from this study (100 Tg C/yr for 1980-2007) is slightly lower, but of comparable magnitude to those based on extrapolated field studies and previous model estimates”. There is only one comparable study listed in Table 3 (Vetter

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et al., 2008) and the C estimates based on that study is more than 50% (not slightly) higher than this study.

Page 2234, line 9: Briefly describe REMO climate data and provide the reference.

Page 2249, Line 24: Delete 'is' before related.

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Interactive comment on Biogeosciences Discuss., 7, 2227, 2010.