

***Interactive comment on* “The carbon budget of terrestrial ecosystems at country-scale – a European case study” by I. A. Janssens et al.**

I. A. Janssens et al.

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Major points:

1) *Methodology poorly described.* We agree with the referee that the methods were poorly described and have added significantly more information in the revised manuscript.

However, this is an integrative paper in which results from many other studies were combined to produce a new result at a larger scale. As such, we tried to give all information related to what we did with the published data, not with how these published data were obtained. Describing the methodologies of each of the different components in great detail would make the manuscript too lengthy, and we therefore refer the reader to the original papers.

2a) *I recommend a figure that shows the net carbon flux of each country with error bars on the flux, ...* This is accomplished by adding Table 1.

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2b) ... and a detailed methods section on how these errors were calculated, ... inserted at the end of MM.

2c) ... and a paragraph in the discussion on the implications of this error analysis. included in section 3.6

3) *The writing is hard to follow.* As a non-native English speaker it is not easy to write in proper English and I fully realize that this often reduces the clarity of the manuscript. Hence, I really appreciated the constructive comments raised by the referee and I have tried to improve the text wherever it was unclear.

Details: Abstract

1) *Sinking* has been replaced

2) *Arable* soils has been replaced by croplands

3) *Lower than expected* has been replaced by the sentenced suggested by the referee.

4) As requested, the 2nd paragraph has been completely revised.

5) *Firstly and secondly* have been replaced by first and second.

Details: Introduction

6) *Post-Kyoto regime...* This comment is now obsolete because the entire paragraph has been removed.

Details: Materials and Methods

7) In 2.1: *Strong statement?* We have added the number of plots that are being monitored (420 000) to clarify that there is indeed a good coverage. As requested, we also added a citation to support this statement, but have nonetheless softened the statement by replacing all by most.

8) In 2.1: *All other C stocks are usually simulated ...* We included a long paragraph to provide more details on how exactly these pools are simulated.

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9) In 2.1: As requested, we included the main outcome of Mark Harmon's work and cited his work.

10) In 2.2, 1st paragraph: *Please describe the potential error of the assumption that agricultural C stock changes are limited to soil C changes, because this is certainly a false assumption ...* I disagree with the referee on this point. In agricultural fields, above-ground biomass does not change over longer time periods (years to decade). Hence, there are no C stock changes in the field. Also the harvested products are not as long-lived as the woody products and thus will not result in C stock changes.

11) In 2.2, 1st paragraph: *How did you estimate the amount of C in the harvested products?* There obviously was serious miscommunication here. The harvested products were not measured nor used in the study. The entire paragraph has therefore been re-written to clarify this.

12) In 2.2, 2nd paragraph: *Was this approach also used for forests and peatlands?* No it was not. We did not take any action.

13) In 2.2, 2nd paragraph: *Be more specific for Yugoslavia.* OK, done, we replaced it by : all former-Yugoslavian countries.

14) In 2.2, 2nd paragraph: *Exactly what countries are included ...* This has been included in the first paragraph of the Materials Methods section.

15) In 2.2: *add scheme?* We made such a scheme, but this turned out to introduce more questions than it solved. Therefore we opted to add a paragraph in the beginning of the Materials & Methods section.

Details: Results and discussion

16) Section 3.1, *As expected* This comment is related to one raised by Jan Siemens. Since both these readers misinterpreted fig. 1, this indicates that figure 1 is confusing. To solve this, we have improved the legend of figure 1.

17) Section 3.1, *Why didn't you address country-specific variation in decomposition ...*

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We decided not to go in detail here because these results were thoroughly assessed in other papers, which we do cite. This manuscript focuses on national budgets, not on the underlying processes. Providing even more detail would make the manuscript too diffuse.

18) Section 3.2, Same comment and reply as in point 16. The legend of the figure should clarify this point.

19) Section 3.2, *please explain what "baseline fluxes" are?* OK, this has been changed in the revised version.

20) Section 3.2, *If the CESAR model has invalid assumptions, why did you use it?* There is good evidence that because of the false assumption, the model overestimates the true C losses. We noticed that the best estimate tended to overestimate the true losses and that the lower confidence limit tended to underestimate the C losses. Therefore, we decided to use the model anyway. Furthermore, there was no better alternative.

21) Section 3.3, *you never presented the forest soil sink.* OK, in the revised manuscript, we now state the forest soil C sink (30% of the total forest sink).

22) Section 3.3, Same comment and reply as in point 16. The legend of the figure should clarify this point.

23) Section 3.3 (now 3.4), start new paragraph at: *Because both forests and grasslands ...* = OK.

24) Section 3.4 (now 3.5), *line 21. confounds* has been replaced in the revised manuscript.

25) Section 3.5, (now 3.6) *What do you mean by very small?* this sentence has been revised.

26) Section 3.6.1, (now 3.7.1) As requested, we have rewritten this section to more

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clearly convey our message.

27) Section 3.6.1, (now 3.7.1) As requested, we have linked this section to the rest of the text by adding an introductory sentence.

28) Section 3.7.1, (now 3.7.3) *What does IT stand for?* OK. Has been rephrased in the revised manuscript.

29) Section 3.7.1, (now 3.7.3) *remove parentheses.* OK.

Details: Figures

We tried the suggestions raised by the referee, but they did not improve the clarity of the graphs. In contrast, the country data can now easily be obtained from the new data table.

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