

Interactive comment on “Simulating carbon exchange using a regional atmospheric model coupled to an advanced land-surface model” by H. W. Ter Maat and R. W. A. Hutjes

H. W. Ter Maat and R. W. A. Hutjes

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Reply to Anonymous Referee #2

We thank the reviewer for his detailed yet constructive comments. They were of great help in the revision of our paper which we believed significantly improved the quality of the paper.

The textual comments are being dealt with and corrected where needed. The other comments are briefly discussed below.

Two important issues are raised by the referee in the General Comments section considering i) interpretation of results and ii) seasonal dimension of the experiment. I will

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try to reply to these points:

i) by adding a statistical analysis of the simulation results (table 4-6) we hope to have added more clarity on the performance of the model compared to observations. The authors also have removed many subjective phrases in the manuscript to which the reviewer rightly objected.

ii) the seasonality of the modeling experiment is certainly an issue, but could hardly be analysed with the present data set. In the RECAB project observations were also taken in the winter time in The Netherlands, but highly variable meteorological conditions made interpretation very complex, and we focused intensive modeling efforts only on summer time. Seasonal dynamics will be addressed in a project financed by The Netherlands research program “Climate changes spatial planning”. In this project observations are being taken (observational towers, ceilometers, scintillometers, airplane observations) throughout a whole year (2008), and data and model analyses is already underway. For these reasons we refrain from discussing seasonality issues in this paper.

Specific comments: 4167; prominent peak in October is explained in the manuscript

4170; Personnel who operated the towers and aircrafts are mentioned in acknowledgements and some are also included as co-authors

4170; flight altitude is given

4171; bi-linear interpolation is more in detail explained

4172; interpretation of validation against station observations is extended significantly taking into account the referee's comments

4173; scripting language of figures 10 and 11 is checked and modified

4173 - As for the aircraft hygrometer, it was a Licor7500 IRGA of the first series, affected

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by the well known sun angle influence (Licor letter Feb. 2002). To avoid as much as possible such effect, the analyzer was shaded on both lateral sides with an external holding frame. In addition, data were quality checked for this effect, that was clearly detectable on data streams as steep changes in CO₂ signal. The effect on H₂O signal was in any case not detectable.

4174 – the reason (“near-absence of turbulent diffusion”) why the model simulates fluxes better near the surface is actually given in the sentence before.

4175 – considering figure 14 the authors want to point that it is tricky to combine this figure with figure 9 as these figures don’t correspond to the same site. However, the referee is right in suggesting that the photosynthetic activity is not overestimated by the model. The authors suggest that the underestimation is more influenced by a stronger uptake of CO₂ by the North Sea.

4175 – the referee combines figure 14 and 15 together to question the applicability of the model and to what degree the model can be trusted. One thing that the authors want to show is what the model’s performance is given the databases ready to implement in the modelling environment. It would be better if the author’s could implement a fine-resolution anthropogenic emissions map with near-reality emissions. However, this is not the case and with the limitations we present the current model’s performance. In more recent initiatives more attention is put on anthropogenic emissions but also on getting better flux databases for various land use classes.

4177 – clouds in this context mean plumes of contaminants. This is explained in the manuscript as well

4179 – the manuscripts ends with an outlook in what way the presented model should be improved and could subsequently be used for in the future

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