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Interactive comment on “Atmospheric CO₂ modeling at the regional scale: an intercomparison of 5 meso-scale atmospheric models” by C. Sarrat et al.

Anonymous Referee #2

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It is quite clear that for a proper simulation of CO₂ interactions between the biosphere and the atmosphere models have to operate in high resolution because non-linear processes are acting in heterogeneous landscape. Development of forward and inverse modelling applications calls for high-resolution atmosphere-biosphere models. Modellers should know which processes are actually simulated and how well.

In this paper, four such, and one only meteorological, meso-scale models are tested against measurements. This intercomparison of very high resolution models is a significant contribution to the development of modelling tools for solving terrestrial carbon sinks. The paper merits to be published in BG. There are, however, some general and

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technical issues which should be developed before publishing in BG.

The major deficiency of the paper is that analysis of the simulation results is very short or missing. Why some models do better and how good they are? I would like to see in the Abstract, Results and Conclusions more quantitative results, not just reasonable agreement; and reasonable accuracy;. These very qualitative expressions are confronted with a sentence in the Conclusions;The uncertainties are still high, compared to what would be required for really accurate inversion calculations;. Quantitative benchmarking measures to really compare the models, and which could be used in other studies as well, would be valuable to ask such questions as how good the models are and how good they should be.

To help readers to compare the models, there should be more information on the models and simulations. This information should be given in more structured way (table(s)) highlighting the similarities and differences between the models.

Description of measurements is very short. Only one paragraph in the Introduction and scattered information in the Results. It would be interesting to know how accurate and intercomparable are the measurements (especially CO₂ concentrations) which are used for this comparison.

The structure of the Results chapter is clear going through different parameters from met observations to CO₂ concentrations in the ABL.

The authors should thoroughly and in detail go through the BGD paper to correct typing and spelling errors which are numerous.

The authors use acronyms for models but they are different in the text and figures and captions. Each model should have only one acronym. They should check also other acronyms. For example, ABL, ABLH and ABL height are used to denote the same thing.

Some of the Figures are really small and difficult to read in the printed version. In the

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electronic version one can zoom in that helps.

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