

## ***Interactive comment on “Detecting regional variability in sources and sinks of carbon dioxide: a synthesis” by A. J. Dolman et al.***

**Anonymous Referee #2**

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Review of 'Detecting regional variability in sources and sinks of carbon dioxide: a synthesis' By AJ Dolman et al

The paper introduces the CERES experiments as part of a special issue. As such a synthesis paper one should not only bring results from different groups together but rather combine the results obtained, give a comprehensive overview and stress on the main points achieved by bringing all the scientific and technical power together. Which of the problems having had in earlier publications have been solved during the project?

Reading this paper does make it necessary to look up a lot of other papers anyhow, but in this case I see the same figures several times. Although being a synthesis paper it should be able to stand alone.

C55

Without being involved in the project and having read the papers dealing with the experiment the reader is often lost with specific phrases. The language is often not precise enough; I tried to correct some of the deficiencies.

The abstract does not tell clearly enough, what the main goal of the experiment was and what the aim of the paper is.

Check abbreviations, these are often unclear for a reader not involved in the topic (eg intensive observation period is never mentioned in the manuscript, but only IOP).

English language should be improved.

Specific comments:

P 2332, l 9-11: 'Overall...characteristics.' This sentence should be reformulated to make the sense clear. Was the main goal the verification of models?

P2334, l 12ff: the experimental set-up and field conditions are described already in Dolman et al, 2006. At the end of the project a synthesis paper should provide more than that.

P 2335, l25ff: Even if it has become common practice to say something like 'a tower is measuring' etc it is still a bad practice, in my opinion. The towers, aircraft or stations are equipped with instruments but are not actively doing anything. To be correct this should be re-formulated.

P2336, l 2: for most readers it may be clear what is done with radio-soundings, but I think it should be mentioned what measurements are performed with these.

P2336, l 19: here one should add, whether the 3D circulation is taken into account and where this is discussed. This is one of the points the paper should summarize.

P2337, l 23/24: respiration is mainly driven by temperature not by soil moisture. Why do you highlight only soil moisture?

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P2337, l 29: what is a 'Dimona flight'? A reader not involved in the topic probably does not know that this is the aircraft type.

P2338, l 17/18: the main reason for different BL heights is the partitioning of available energy into sensible and latent heat fluxes, which may of course be influenced by different moisture regimes.

P2339, l 7: what is a cold bias? And in a synthesis paper one would expect to hear whether these problems are solved now.

P2339, l 13: problem solved now?

P2340, l 28ff: I don't understand what the authors want to tell the reader and what is the relation with the CERES experiment.

P2341, l 10/11: No, the previous section has not made clear this but is a list of what has been done to investigate these complex patterns.

P2342, l 20ff: the introduction of these interesting measurements should not be part of the conclusions section, instead all the measurements as well as the modelling should be brought into one context.

P2344, l 12/13: constant pressure balloons have not been mentioned before in the paper

Minor/spelling/language:

P 2332, l 4: '...such as sea breeze...'

P 2332, l 7: 'scalars' or 'constituents' instead of 'concentrations'

P 2332, l 8: '...France in 2005 and 2007 as well as subsequent analysis of modelling results are described.'

P 2332, l 17/18: '...), at the continental scale the inverse method determines sources and sinks of CO<sub>2</sub>, albeit...'

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P2333, l 1: '...source and sink strength of CO<sub>2</sub> and...'

P2333, l 4: '... CO<sub>2</sub> injected in the lower atmosphere...' or '... CO<sub>2</sub> injected in the troposphere...'

P2333, l 12: '...field that have to be taken into...'

P2334, l 4: '...large concentration gradients develop...'

P2334, l 6: what do you mean with '...these need to represent accurately...'

P2336, l 5: 'Three aircraft...'

P2336, l 22: closing bracket missing

P2337, l 5: '... with variable directions...'

P2337, l 16: what is high precision at the tower?

P2337, l 25: '... diurnal pattern of CO<sub>2</sub> at Biscarosse...'

P2338, l 6: '...conditions), low net uptake of CO<sub>2</sub> and reduced...'

P2338, l 9/10: 'Fig. 7 shows the fluxes...'

P2338, l 11: '...above ground by the aircraft instrumentation.' Again: the aircraft itself is not measuring but only transports the instruments.

P2338, l 12: '...the vineyards whereas net CO<sub>2</sub>-uptake over the forest is relatively weak.' Otherwise you don't have an indication for the direction of the fluxes.

P2338, l 24: '...as the temporal evolution of CO<sub>2</sub> concentrations in interaction with...'

P2338, l 26ff: the models do not provide any transport, you should rather write: '...models may reflect adequately the transport processes of CO<sub>2</sub>...'

P2339, l 11: '...earlier noted by Vila...'

P2339, l 7: a or b missing in Sarrat reference

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P2341, l 6: '...show also that the improvement of ... simulation is highly dependent...'

P2341, l 13: '...when site data are used...'

P2341, l 16: '...requirement for this to be successful is...'

P2341, l 23: '...the model dependence on the boundary...'

P2342, l 1+2: variance of what? Correlations of what?

P2343, l 13: '...sensible heat and latent...'

P2343, l 24/25: reformulation necessary. Models do not carry CO<sub>2</sub>!

P2343, l 27: '...patterns of carbon exchange...'

P2346, l 17ff: the paper itself has to be cited, not the book

Table: Abbreviations such as RS and BVC have to be explained at least once in the paper.

Figures: Figure 1: the figure has been shown many times, but at least for a journal it should be improved: 'pattern' instead of 'patern'

Diamonds are flux sites, please mention somehow, probably instead of the grey hexagon.

Figure 2: text: '...because of a small net uptake CO<sub>2</sub> at the surface.' instead of '...because of a small CO<sub>2</sub> surface flux.'

Figure 3: the area should be zoomed according to Fig. 1 and Fig. 4 to see more details and to make them comparable.

Figure 6: the left panel figure should either cover the same area as figure 1 or show land use as well to make clearer where and why differences occur. The size has to be extended for the final print.

Figure 7: size for final print has to be extended. It has to be mentioned that size of

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circles represents flux size. Legend for land use is missing, especially as the colours are different from those in fig. 1.

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