

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

A. J. Dolman

han.dolman@geo.falw.vu.nl

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All reviewers are thanked for their analysis of the paper. They express some concern with the level of in depth analysis and synthesis. We agree that this was a major weak point of the current version, which we hope is corrected in the final version. We reorganized the paper. The main aim is now formulated as: “The main subject of the paper is: “The current paper briefly reviews the experimental setup of the CERES campaigns with the aim of providing an overview of the instrumentation used and of the dataset. It then tries to assess progress in the field of regional observation and modeling of carbon fluxes, thus bringing the papers of this special issue into a more coherent context of analysis. We finish with a set of recommendations for work that remains to be done before the overall aim of a developing region carbon data budgeting sys-

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tem can be achieved.” We added a new section “Progress in instrumental deployment and experiment planning”. This describes developments in three new areas: concentration measurements from tall towers, flux aircraft and concentration measurements from aircraft in the PBL and describes the links with the fluorescence campaigns. We hope the paper is now more “in balance” (reviewer 3). We took out the section (3) that described the last two campaigns and showed soil moisture, LAI and PBL development. Taking this section out allows better focus on the key messages of the paper. We deleted figures 2,3 and 4. In the forward modeling section we added a new introduction: “The focus on the regional scale calls for assessing the performance of the current generation of mesoscale models to simulate adequately the transport mechanisms at meso-beta (sea-breeze, topographically induced flow) and meso-gamma (flux heterogeneity, boundary layer cloud) scale. During the project we used three different mesoscale models, The French, Meso-NH system, the Regional Atmospheric Modelling System (Pielke et al., 1992) and the Weather Research and Forecasting (model (WRF, Skamarock et al., 2005)). Ultimately one would be able to use the transport of the mesoscale models in backward models to calculate the regional sources and strengths. To be able to do that first the capability of the current models needs to be assessed against the observational data obtained during the campaigns”. We hope this better outlines the line of thinking we follow in the rest of this section. As suggested we are more specific in the new version about the errors and the still existing problems by listing them more explicitly. However, since the main aim of this paper is to discuss the use of these models to describe the transport of CO₂ and not a status report on mesoscale modelling capabilities, we need to maintain an acceptable balance. We added a new figure (from Ahmadov et al., 2007) that shows shows the horizontal distribution of near-surface CO₂ and wind on 27 May 2003. This picture also shows over the shore an area the wind convergence that results in a large area of enhanced CO₂. This graph shows very clearly the effects of seabreezes. We added a new figure (5, see attached graphics) in the new paper that summarizes the interactions that need to be understood and modeled well in regional scale carbon balance. This schematic re-

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places the previous version 2. We hope that with these substantial changes the paper is better readable and more able to “stand on its own”. Other more minor comments: Reviewer Vila We address the scale (meso-gamma) more explicitly. We extended the discussion on spatial observations and heterogeneity by being more explicit about the limitations of the observing systems (e.g. fixed towers and aircraft). In the discussion we also explicitly address the concern about flux heterogeneity. Reviewer 2 We rewrote the abstract by stating more explicitly the goal of the paper (see above). Acronyms will be written out the first time used. The comment made on line 2341 l 10-11 is probably critical here. We make this more clear in the new structure (see also comment above) when we discuss first the “standard” mesoscale model capabilities, and then the CO₂ implications (and what remains to be done). Comment on line P2342 l 20. We hope by extending the instrumental section, that this will be covered. Reviewer 3. We include references to homepages and the database. All other comments are dealt with by appropriately changing the text.

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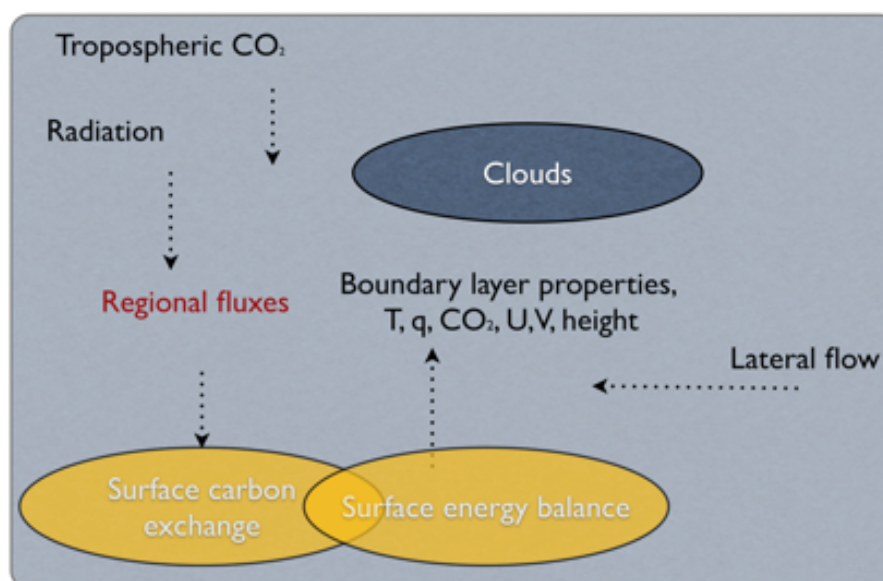


Fig. 1. New Figure 5

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