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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A conceptual framework to quantify the influence of convective boundary layer development on carbon dioxide mixing ratios" *by* D. Pino et al.

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First of all, we would like to acknowledge the positive review. Regarding the specific comments, we would like to answer them one by one:

1. The introduction has been modified. We have reviewed the "state of the art" by including new references. 2. References about the quantification of CO2 advection have been included in the manuscript. Moreover, the pros and cons of the presented analysis will be written in a more elaborate way. Regarding this specific point, we would like to note that we are currently investigating the influence of CO2 advection on the CO2 diurnal variability. This new research will complete the results presented in this paper.

3. The referee is right. Regarding the BL dynamic (initial/boundary) conditions the sensitivity analysis show that the formulation is valid over a wide range of boundary layer conditions: lapse rate from 0.01 to 0.001 K/m and inversion strength form 0.2 to 5 K. As mentioned in point 2, including the advection of carbon dioxide is work on progress. We have already selected an additional day 12th March 2006, (Casso-Torralba et al., 2008) where the CO2 contribution due to advection was significant. Preliminary results obtained shown that the formulation is also valid for this day. However, for the moment we prefer not to include them in the new version of the manuscript.

In addition to these points, in the new version of the manuscript we will clarify two specific points. First, we will discuss under what conditions the error linear analysis presented in section 2 is valid. Second, it will be included in section 4 a more detailed description of the errors that would be obtained on the CO2 mixing ratio and inferred surface flux if typical errors: 100 m for the boundary layer depth, 1 ppm for the morning CO2 mixing ratio, . . . on the studied variables were considered.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 32769, 2011.