

Interactive comment on “Mechanisms for synoptic transport of atmospheric CO₂ in the midlatitudes and tropics” by N. Parazoo et al.

Anonymous Referee #2

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This paper investigates the processes leading to synoptic scale variability observed at continuous CO₂ sites in North America, Europe and South America. Through a detailed analysis of meteorological parameters related to weather fronts and of a budget equation, the relative contribution of advection and local cloud as well as surface fluxes is quantified. The atmospheric transport model is used for sensitivity tests in order to study the effect of differences in atmospheric circulation between North America and South America.

The topic of the paper and the methods as well as conclusions is of relevance for the readers of ACP. It is well written and I only have a few comments. I recommend that the paper is accepted for publication in ACP after some minor revisions, see suggestions below.

The only weak point in the paper is that part of the analysis is based only on data from one site in the tropics and a few sites in North America. But the authors also note this and recommend further studies when more data from the tropics are available.

Specific comments:

In order to make the paper more readable a small section describing why the topic of the paper is important should be added to the introduction. E.g. what implications might it have for our assessment of the carbon budget, if we do not fully understand the processes related to synoptic scale variability of CO₂. Some of this is already mentioned in the last section before the summary and conclusions.

It could also be interesting if the authors could give some recommendations for where modellers should focus in future model improvements. It is well known that PBL dynamics, especially during night time, is a problem in most models. But this study implies that moist convective transport also is important.

Page 12202, lin. 1-10: was SiB3 run for the same period as PCTM?

Table 1: Why are there references added to only a few (ZEP, HEI, HUN) of the sites and not all?

LEF: add Northern part of North America; before Wisconsin.

The reference to Stohl et al. at ZEP is maybe not the most appropriate reference for this site? For HEI the ref. should be (Gamnitzer et al, 2006) but again maybe not the best ref. for this site.

Fig. 3 and 4: At some of the sites the model does not capture the observed frontal CO₂ climatology very well. Do you have a possible explanation for this?

Technical corrections:

Table 1: SGP and WKT: of strong moisture gradient; should be: of strong moisture gradients; (?)

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Fig. 7: add "a" before 4-day period.

In the print version of the paper, some of the plots are too small. Do not know if this can be changed in the final version?

References:

Denning et al. 1996a " "; should just be 1996?

Law et al. is located wrongly in the list (move to after "K");).

Sellers et al. 1996a " "; should just be 1996?

Is the Bakwin et al. 1998 referred to at page 12199 missing in the list?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12197, 2008.

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