

Editor Initial Decision: Publish subject to technical corrections (02 Jun 2014) by Dr. Patrick Jöckel

Comments to the Author:

Dear Authors,

Thank you very much for your detailed replies and the revised manuscript. Before final publication in ACP, I would like to ask you to consider two minor, yet in my opinion important, amendments:

- 1) The aspect of mixing, mentioned by referee #2, (issue 2.) has only been answered in your reply. I think this brief discussion should also be included in the manuscript (at a suitable position of your choice) for readers who are not so familiar with Lagrangian models.
- 2) The same holds for the aspect of the sampling (referee #2, issue 4). It has nicely been answered in your reply, but the note referring to Park et al. should also be included at a suitable position in the manuscript.

Yours,

Patrick Jöckel

Reply to Editor:

We have great appreciation to the editor's comments. Now we have added those missed lines into the manuscript.

- 1) A short discussion of mixing has been added to the end of Section 2.1 (page 5, lines 140-148 in the latest manuscript), where the general features of the trajectory model are introduced. This paragraph reads:

One advantage of Lagrangian framework is its ability to trace the full evolution of parcels due to no explicit mixing during the entire trajectory integration. However, there is an effective 'mixing' when many parcels are averaged within grid boxes to be compared with either observational or Eulerian model results (see Sect. 3). The mixing in extra-tropical tropopause is very important, but in this paper we mainly focus our results on the tropical lower stratosphere, where the strong vertical gradients of chemical species indicate less mixing occurring. In fact, it is because Lagrangian models producing non-diffusive transport and thus are especially accurate in regions where there are strong tracer gradients (e.g., the edge of polar vortex, the tropopause).

- 2) The referring to Park et al. (2013) that claims no substantial differences exist for whether sampling at ACE-FTS measurement locations or not has been added to page 10, lines 300-302, where the discussion of ACE CO just starts. The addition reads:

Here, instead of sampling trajectory results at the ACE measurement locations, we only took zonal mean averages because as mentioned in Park et al. (2013), the differences between two processing are negligible.