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Interactive comment on "A regional CO_2 observing system simulation experiment for the ASCENDS Satellite Mission" *by* J. S. Wang et al.

Anonymous Referee #2

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This study used Observation System Simulation Experiments to assess impacts from the ASCENDS observations on top-down regional flux estimates. In particular, it highlighted the potential for inferring flux estimates at high temporal and spatial resolutions from dense space-borne XCO2 observations. It is well written, and I recommend it for publication after some modifications.

Major comments:

1. Instead of the complete flux inversions, only the error reductions have been calculated in this study. So, it did not fully assess the ability for their flux inversion system to recover the 'true' regional fluxes by assimilating ASCENDS observations. For example, the possible adverse effects from errors in boundary conditions and errors in

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model transport have not been quantitatively investigated, although they have provided some interesting discussions in Section 4.

2. I am not sure whether the comparisons with the error reductions in global flux inversion experiments have significantly enhanced the main discussions. Instead I'd like to see, to which extent the global flux inversions based on ASCENDS measurements could reduce boundary condition errors as discussed in Section 4.2.

Minor Comments:

1. Page 12824, Line 21: 'Kx=c, where x is the vector of fluxes, and c denotes concentrations',

This statement is not accurate as the definition of the Jacobian, as the concentrations also have contributions from background or in-flows etc.

2. Page 12826, line 13: 'The errors for 5km (0.74s) individual CALIPSO ...',

What is the footprint size for the aggregated 10s observations ?

3. Page 12834, line 23:', and the assumption of zero a priori correlation ...',

Are the temporal error correlations of apriori flux estimates set to be zero as well ?

4. Page 12835, line 16: 'Thus in our inversion, less information is available ...'.

The phrase of 'less information' can be misleading.

5. Page 12852, Caption: (10^{-6} ppmv^{-1} hPa^{-1})

Is this unit (ppmv^{-1}) right ?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 12819, 2014.

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