

## ***Interactive comment on “On the parallelization of atmospheric inversions of CO<sub>2</sub> surface fluxes within a variational framework” by F. Chevallier***

**Anonymous Referee #2**

Received and published: 27 March 2013

This paper presents a novel approach to parallelize model transport computations in the framework of variational atmospheric inversions. By dividing the whole assimilation window into several overlapped segments for forward and backward model transport computations, this approach can effectively reduce the wall clock time for variational inversions over a long time window (several decades) to that of a single sub-segment. This paper is well written, and should be accepted for publication.

At the meantime, I suggest the authors to make several clarifications.

1.If I understand correctly, Eq.2 has indeed approximated effects of all analysis increments in previous segments to current atmospheric concentrations by using a mean global bias. While the inversion results have been shown in good agreement with reference experiments (in particular, with the short window one), I want to know how

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accurate this approximation itself is. My concerns are:

a) If we have a dense observation network to capture more detailed spatial variations, this approximation could degrade the ability of a variational inversion system to estimate small-scale surface fluxes unbiasedly. b) For other trace gases such as CH<sub>4</sub> and CO, analysis increments may be difficult to be replaced by a change to their annual global growth rates.

2.It is right for the author to point out errors in modelling atmospheric transport. To this end, is it more suitable to use even shorter segments (maybe together with more complicated bias terms) ?

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Interactive comment on Geosci. Model Dev. Discuss., 6, 37, 2013.