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Interactive comment on "Climatologies from satellite measurements: the impact of orbital sampling on the standard error of the mean" *by* M. Toohey and T. von Clarmann

Anonymous Referee #2

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The paper discusses the important issue: influence of sampling patterns by the satellite measurements on climatologic estimates. The focus of the paper is the standard error of the mean, in application to monthly zonal mean ozone data.

The statement of the problem and the theory are well formulated. However, I have concerns about the realization of the idea:

1) Limited model resolution.

CMAM (according to the given reference, Eyring et al, 2006) has a relatively low resolution, 3.75 deg x 3.75 deg. The size of model grid in latitude is comparable to the size

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of latitude bin for estimating of the monthly mean data (5 deg). Model temporal resolution, output every 18h, is quite coarse. Furthermore model gives snapshots at some (UTC) time, while satellite measurements at successive orbits at given latitude are performed at approximately the same local time. It seems that the model field used in the analysis not only under-samples the "true" atmospheric ozone field, but also cannot reproduce the variability, which can be observed in satellite data. Unfortunately, the authors have not described the details of how they "subsample model fields based on the sampling pattern of a satellite instrument" (while this is very important). Unless a special technique is applied, the sampling of the low-resolution model field with dense sampling pattern will result in "correlated" measurements. This correlation can be stronger than in the real atmospheric field, thus affecting experimental estimates of the SEM (especially in case of dense sampling pattern).

2) Measurement noise is not taken into account in the simulation, while it makes measurements "more random".

3) Even with very fine spatio-temporal resolution, chemistry-transport models do not describe all small-scale processes in the atmosphere. For example, perturbations caused by gravity waves are not simulated. Although small in magnitude, these perturbations result in additional variability (and thus randomness) of the ozone field. This should be at least mentioned.

These aspects might affect the quantitative estimates obtained in the paper.

Technical comments/corrections

- Fig.2 caption, misprint in "approximating"

- Fig.5: Please indicate units.

-p.8246 , l.18. "exact"-> "exactly"

- p. 8248: Why data from 13 January–17 February 2003 and from December 2008–26 January 2009 were used for March sampling? Why simply March sampling cannot be

taken?

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8241, 2012.

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