

## ***Interactive comment on “Key aspects of stratospheric tracer modeling” by B. Bregman et al.***

**B. Bregman et al.**

Received and published: 4 September 2006

Reply to referee #2

We thank the referee for the constructive and useful comments. Below we give our reply.

We have re-organised parts of the manuscript as suggested by referee #1 and introduced a section Discussion. We also made the experiment labeling consistent throughout the manuscript and divided the section Results into different subsections to improve the readability.

With permission of the referee we have added the results of an important additional dispersion calculation demonstrating the great sensitivity of air parcel dispersion in the tropics to the starting altitude of the back trajectory calculations and discuss this finding

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in the section Discussion.

### Major points

Following the referee's wish, we have added three experiments in the mean age of air diagnostics labeled '3x2-slopes red. grid' with a reduced polar grid, '3x2-slopes' without a reduced grid and '1x1-slopes' without a reduced polar grid. Mean age of air experiments with other model versions have been published elsewhere as mentioned in the manuscript which made us decide not to redo there experiments.

We have adjusted the text concerning the geostrophic balance.

Figure 1 has been removed.

Figure labels have been corrected.

This is an interesting point. We agree that there may be differences in wind variability depending on whether the point of view is lagrangian or Eulerian. We have added in the text that the statement is based on a Eulerian view. In the text we also mention the study of Waugh (1997) who addresses the effect of aliasing and agree with the reviewer that this is an important aspect. However, we are not aware of any study that compares wind variability in 3-hourly versus 6-hourly trajectories. We would appreciate if the referee could inform us if such study exists. In the mean time we have done a calculation with 12-hourly and 6-hourly cycles. The back-trajectory model could not apply 3-hourly operational analyses within our time frame. Nevertheless, the differences between 12-hourly and 6-hourly back trajectories should give an indication of the effect of update frequency. We calculated 1080 30-day back trajectories at different latitudes, starting at 56 hPa. We found compared 2sigma of U, V, and omega and found that only on the NH there is a slight decrease in sigma when using 6-hourly data, while there is no significant difference on the SH. If the referee wishes we would be pleased to send the results for further discussion.

We decided to maintain focus and not to add this discussion to the manuscript.

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The referee is right that the very last polar cell (the pole cap) is averaged over all longitudes, which is necessary for the reasons the referee pointed out. We have clarified this more clearly in the text.

#### Minor points

We have corrected/adjusted all typo's etc. pointed out by the referee and included additional explanation where needed.

Below we provide additional reply where required.

Concerning figure 7, the variability represents two-sigma calculated for all the model grid cells corresponding to a specific equivalent latitude. The mean values represent the mean model results for that equivalent latitude. We have elucidated this in the text and the figure caption.

We have skipped the emphasis on the southward extension. We agree with the referee that such conclusions are difficult to make on basis of equivalent latitude.

Concerning the referee's reference suggestion, of course we did have your well-known paper in our system. This reference was included in the manuscript, but has somehow slipped out for unknown reason. We apologize for this, included it again and thank the referee for letting us know.

We have adjusted all experiment labels to make them consistent throughout the manuscript.

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 4375, 2006.

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