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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of stratospheric airmasses on tropospheric vertical O_3 columns based on GOME (Global Ozone Monitoring Experiment) measurements and backtrajectory calculation over the Pacific" *by* A. Ladstätter-Weißenmayer et al.

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The present paper makes use of back trajectories to identify possible sources of tropospheric ozone maxima found from GOME data over Tahiti. Lagrangian methodology, based on trajectories as well as a Lagrangian particle model, has been applied in the STACCATO project to investigate the stratospheric influence on mid-latitude ozone concentrations (Stohl et al., 2003a, and references therein; Stohl et al., 2003b). The methodology applied in STACCATO could have been a useful inspiration also for the

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present work.

The present work is faced with considerable uncertainty as the GOME instrument gives the total column of tropospheric ozone; its vertical profile remains unknown. This means an inherent uncertainty in the back trajectory study: one does not know which level is really relevant.

The authors claim that their Figure 3 proves that there is no larger anthropogenic influence over Tahiti than at the other two sites. However, I see in this figure a higher density over Australia and immediately off the Southern Californian coast for Tahiti than the other two sites.

There are also more methodological problems with this evaluation. The 2 km layer next to the ground does not need to coincide with the ABL, especially over a place like Australian deserts and semi-deserts. Forest fires may eject plumes much higher than the surrounding ABL. Cloud venting which is not considered in the trajectory model can do the same.

The authors also seem not to pay attention to the vertical density gradient in the atmosphere in the distribution of the release locations and the interpretation of the back trajectories (cf. Seibert and Frank, 2004). We don't even know whether "trajectory density" means residence times, and Figure 3 has neither a scale nor units.

Similar considerations hold for the stratospheric origin displayed in Figure 4. The criterion of having experienced a certain PV value (without regarding residence time) is a rather weak one for measuring the strength of a stratospheric influence (see STACCATO).

Concluding, I would say that the analysis of the authors gives hints on a stratospheric contribution but cannot rule out anthropogenic or biogenic influences, and certainly it cannot quantify their relative contributions. This would require a much refined methodology.

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A minor issue is that the authors don't give a description of their trajectory model. The references given are an internal user guide which is not accessible and a Ph. D. thesis in German language. There is no evidence how this model has been validated or how it compares to other trajectory models.

References

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