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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal and inter-annual variations in Troposphere-to-Stratosphere Transport from the Tropical Tropopause Layer" *by* J. G. Levine et al.

Anonymous Referee #1

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Little is currently known how haloginated very short-lived substances enter the stratosphere, and even less is known how the transport pathways will respond to a changing climate (e.g., WMO/UNEP Scientific Assessment of Ozone Depletion, 2007). In this context, Levine et al. investigate the pathways of troposphere-to-stratosphere transport (TST) through the tropical tropopause layer (TTL) using trajectories calculated from meteorological reanalysis (ERA-40). The present study expands on a previous study by the same authors that has relied on calculations from a single northern hemisphere winter only. In their present study Levine et al. now discuss (a) the seasonality of TST (b) the inter-annual variability related to the El Nino/Southern Oscillation and (c) hemispheric differences in TST. Moreover, they include a discussion of TST into the

overworld versus transport into the extra-tropical lowermost stratosphere and examine the sensitivity of their results to different tropopause definitions.

The paper is well written and I recommend it for publication in Atmos. Chem. Phys. after consideration of my main comments below.

1. Definition of the bottom boundary of the TTL. I could not find a precise description of where the trajectories are released - neither in the present manuscript nor in Levine et al. (2007). Levine et al. (2007) defines the TTL as being "4 p-TOMCAT grid boxes deep", if I understood this correctly. It would be good to give a few more details here, ideally with some comments on how the particular choice of the trajectory starting points will influence the overall conclusions.

2. Time scale of the trajectory calculations. In the present study, forward trajectories are followed for four weeks. I could not find any discussion of how the results depend on the particular choice of this four week time period. For me it is not obvious how the length of the trajectory calculations will influence the overall results.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 489, 2008.