

Interactive comment on “Composition of the TTL over Darwin: local mixing or long-range transport?” by W. J. Heyes et al.

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Synopsis: The paper describes and evaluates ozone soundings and aircraft observations of ozone and carbon monoxide conducted over Darwin, Australia, during the ACTIVE campaign carried out during the wet period between November 2005 and February 2006. The basic question addressed was to what extent the composition of the tropical tropopause layer (TTL) was determined by deep convection of local air masses as opposed to long-range transport of air masses into this TTL. In addition to evaluating the vertical profiles of ozone and CO, the authors used trajectory statistics to delineate the relative influence of these two processes.

General comments: The writing is generally clear and concise, and the manuscript is easy to follow. The authors make a compelling case for the final conclusion, namely

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that ‘the composition of the TTL [over Darwin area] is ultimately determined by vertical mixing in certain “hot spots” regions of the tropics [far away from the area of direct observation], with advection from these regions dominating the composition elsewhere.’ The methods used to arrive at these conclusions are sound and the analysis is convincing.

Specific comments: The authors present 8 regional maps with colored dots overlaid to illustrate the findings from their trajectory analysis. While these maps are rather easy to understand, this reviewer would prefer to see the whole of the trajectories computed at least once to get a better impression of the transport pathways. Also, in this reviewer’s opinion, presenting numbers on a map to illustrate frequencies (counts, mole fractions) is not the most powerful way to make the point. The suggestion is therefore:

1) In chapter 4.3, mention the total number of trajectories computed; plot all trajectories for the full 10 days as projection on the map using colors to indicate the frequency of occurrence in grid boxes where multiple trajectories pass through. Combine Figures 4 and 5 using color densities to represent mole fractions and, e.g., petals of flower symbols to indicate the number of trajectories. 2) In chapter 4.4, plot all trajectories for the full 10 days as projection on the map using colors to indicate the frequency of occurrence in grid boxes where multiple trajectories pass through.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7299, 2009.