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Interactive comment on "Modelling study of the impact of deep convection on the UTLS air composition – Part II: Ozone budget in the TTL" *by* E. D. Rivière et al.

Anonymous Referee #1

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This paper is devoted to the study of the ozone budget in the TTL perturbed by deep convection over Brazil. The authors show that the ozone budget between 13 km and 17 km is driven by dynamics rather than local chemistry.

Ozone budget: (Figure 8, Table 1 and section 5 "Ozone budget") From Figure 8, the main striking feature is the horizontal flux. The horizontal flux drives the sign and the magnitude of the total flux in the TTL (except during the last 6 hours when it is partly compensated by the vertical fluxes). This feature is clearly coherent with the increase with time of ozone in the TTL shown in Figure 1. Because of compensatory effect in

the mean budget calculation, the role of horizontal advection is minimized whereas it plays a major role in controlling the time evolution of the ozone in the TTL.

Abstract: the abstract should mention that the proposed ozone budget is a regional budget, calculated over a 24-hour period only. It is important to recall in the abstract that the time evolution of ozone in the TTL budget is mainly driven by the horizontal advection term (which is somehow hidden by the one-day mean calculation) as stated in §5.5.

§2: could the authors be more precise on the aqueous chemistry scheme? What are the chemical species for which heterogeneous losses are available? Is the ozone budget sensitive to the aqueous chemistry scheme? How would scavenging by convective precipitation modify their results?

§2: Why would the LNOx parameterisation lead to unrealistic NOx production?

Figure 1: change "09/02/2001 0004UT" to "09/02/2001 0400 UT"

(§5.3, l5), change "the largest contribution in the ozone budget" to "the largest source of ozone". The largest contribution is the advection (although negative).

Role of lightning NOx: "from the point of view of the ozone increases in the TTL, ligthning produced NOx play a more important role in producing locally ozone than in producing ozone below the TTL that would be vertically transported later up to the TTL". It has been stated that the bottom of the TTL is defined by the level just above the maximum convective outflow (Highwood and Hoskins, 1998). The TTL can be penetrated by convection but these events are unfrequents. In this case, from a convective scale point of view, the lightning NOx are unlikely to be deposited directly in the TTL to produced ozone. It seems to me that the authors's conclusion can be biaised by their a priori definition of the bottom and top levels of the TTL in the model. Could the authors comment on that point?

This remark leads to another question. Would the ozone budget be modified if the

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TTL is now considered between 14 km and 17 km instead of 13-17km? The 14-17 km altitude range appears to be a potential candidate for the TTL definition if we refer to Figure 1. This altitude range would put the TTL above the region of maximum chemical ozone production (in Figure 5).

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9169, 2005.