

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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Specific Comments

(i) and (iii)

We have chosen to address these comments here together due to the similarity in some of the issues raised. The discrepancy in the positioning of the discussion of CO information was indeed as a result of the separate measuring platforms, and how the manuscript was pieced together. We quite agree that the information on both would be better placed together and have placed both together for the final revised version of the

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manuscript (page 4, 2nd paragraph onwards). We have also included the definitions of local, long-range and background TTL in the following paragraph (on page 5, paragraph 2). We used the term “background TTL” when referring to the general chemical composition outside of deep convective outflow (i.e. out-of-cloud), in contrast to air inside the convective outflow, where signatures of uplift of low-level air were apparent. In order to remove any ambiguity in the abstract, when referring to ‘background TTL’, we have added ‘out-of-cloud’ to emphasise what we mean.

(ii)

We agree that this is an important consideration. Although previously not mentioned in the discussion paper, ozonesondes were launched at periods both in the afternoon, when local deep convective activity was at a maximum, and in the evening. In fact several of the evening launches were intended to sample deep convective outflow passing overhead; however we did not observe any evidence of uplift from low-levels in the TTL measurements. Both fresh and dissipating anvil were measured by transects of the Egrett. Within the fresh convective outflow, clear signs of air from low-level origin could be observed. However, when sampling across aged cirrus the signatures of low-level uplift quickly disappeared, with concentrations closely in-line with those of the “out-of-cloud” “background TTL” - with these variations accountable by the back-trajectory analysis. Thus it appears that the local deep convection does not greatly perturb the background out-of-cloud TTL. Whether when sampling in a “hot-spot” region you come to the same conclusions that long-range transport dominates and is fed by other distant hot-spots in a paradoxical fashion, we cannot say from this work, although further analysis on datasets such as the SHADOZ network of ozonesondes may help resolve this. We have added a line to the at the end of the paper to indicate that further research is required to confirm similar measurements in such ‘hot-spots’ would reveal a dominant influence from local uplift.