

Petetin et al, 2018

The careful development of vertical gradients for ozone and CO with a focus on the boundary layer is a significant contribution to the community. The climatology developed in this work is unique in that the authors took the boundary layer height into account in their averaging. A very interesting finding is that the weakest ozone vertical stratification is observed not only at high temperatures when mixing is expected to be strongest, but also at the lowest observed temperatures, which the authors hypothesize as potentially being due to weak deposition to snow. Finally, this work clearly shows that an aircraft campaign like IAGOS can provide similar profile information to ozonesondes, which is a very useful result that can inform future more extensive CTM evaluation efforts. This manuscript should be published after minor revisions detailed below.

### **General Comments**

My main comment is that the climatology developed by the authors should be made publicly available for use in model comparison studies. Currently the paper does not provide a method for obtaining this climatology. In addition, the authors should more carefully discuss the type of PBL they describe in their study due to the use of the EI method. This method would describe a certain type of mixing and exclude other situations and more discussion on the meteorology conditions not captured by this method would be useful. Finally, I would comment that there are a large number of figures and the authors could consider moving figures such as Figure 5 to the supplement that may not actually need more than discussion in the text for the general purposes of the paper.

### **Specific Comments**

Page 3, line 14 – If MOZAIC includes NO<sub>x</sub>, it would be useful to comment on why NO<sub>x</sub> profiles were not included, also a very useful compound for CTM evaluation particularly due to the sharp gradients in the PBL and the enhancement in the FT due to lightning.

Page 7, line 25 – I think the titles on Figure 6 are swapped – diurnal variation vs seasonal variation seem to be on top of the wrong plots.

Page 8, line 37 – In Figure 8, it looks like theta increases with altitude everywhere. Please clarify. Maybe the resolution on the plot could be increased?

Page 10, line 2 – Could you comment on why the seasonality in RH is not in agreement between IAGOS and the ozonesondes?

Page 10, line 25 – Please explain the %  $\text{hm}^{-1}$  unit.

Page 12, line 2 – Does the comparison suggest that this climatology is not representative of more polluted regions?

