Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Pollution trace gases C$_2$H$_6$, C$_2$H$_2$, HCOOH, and PAN in the North Atlantic UTLS: observations and simulations" *by* Gerald Wetzel et al.

Anonymous Referee #3

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This paper presents observations from a new airborne remote sensing instrument, GLORIA. Results from several different models are compared to the observations, with the aim to demonstrate the reasonableness of the observations, as well as to identify the sources of the features of the observed distributions. The model-observation comparisons are also presented as an evaluation of the models. I feel the paper needs some modification prior to publication, as discussed further below.

The presentation of these new observations, along with the description of the measurement technique, is worthwhile. However, the goals of the paper should be made clearer. The uniqueness of the observations could be more strongly emphasized. It

would be helpful to have some sort of validation of the observations through comparison to aircraft data from established measurement techniques.

The introduction seems rather awkward, with the discussion of the measured compounds seeming rather disjointed. Perhaps more discussion of the measurement technique and its uniqueness would be more appealing to readers, and then an explanation of why these species are discussed - driven by the capability to measure them. The explanation of their role in atmospheric chemistry could be saved for the analysis discussion. At l. 41, PAN is a 'secondary pollutant', not 'secondary order'. At l. 51, in what sense is ethane 'most important'?

The purpose of the model results in the paper should be made clearer. Are they being used to provide validation of the observations? It would be more appropriate to just use the model to explain the distributions and identify the sources of high mixing ratios.

Using 60-day back trajectories seems rather a stretch. I would not think they are reliable that far back. The forward CLAMS simulations of various regional tracers seem more reliable, so the back trajectories seem unnecessary.

The conclusions seem to discuss more the model evaluation aspects of the observation-model comparisons, which I do not find fully justified by the presentation of the results.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1215, 2020.