Atmospheric
Measurement
Techniques

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Discussions

Interactive comment on "**Nitrogen dioxide and formaldehyde measurements from the GEOstationary Coastal and Air Pollution Events (GEO-CAPE) Airborne Simulator over Houston, Texas**" *by* **Caroline R. Nowlan et al.**

Anonymous Referee #1

Received and published: 23 August 2018

1   General comments

The paper describes the retrieval of NO2 and CH2O columns and their uncertainties from GCAS instrument during DISCOVER-AQ campaign and compares them with in-situ aircraft and ground-based profile and column observations. The topic of the paper is well within the scope of AMT.

The paper is mostly well structure, but discussions of the results are currently spread

over various sections. I suggest adding a "discussions" section at the end of the paper to discuss the large biases between GCAS, Pandora and P-3B in context of the expected uncertainties of the three different datasets.

The description of the retrieval uncertainties is very detailed but does not include uncertainties form the reference columns. Furthermore, the total expected uncertainty of GCAS NO2 and CH2O columns due to instrument noise, AMF uncertainties and reference column is not calculated but is important to understand if the results of the comparison are within the expected uncertainties.

Furthermore, a calculation of the expected uncertainties from the preparation of the Pandora and P-3B data for comparison with the GCAS columns is also missing. In particular, the effects of cutting and extending the columns using the (uncertain) model data should be calculated.

Finally, the description of the vertical column results (Section 5) is difficult to understand, because the locations of the discussed landmarks are not marked in figures 3 to 6. It would be beneficial to update the figures or provide larger version in the supplement.

In summary, I recommend publication of this paper in AMT after minor revision.

2   Specific comments

P8, L4: rename section from "Calibration" to "Spectral calibration".

P8, L12-14: The sentence on radiometric calibration can be removed, because it seems not to be relevant to the paper.

P8, L29: Please add a paragraph about the results of the spectral calibration (wavelength shifts, slit function and their uncertainties) and the impact on the SCD uncer-

tainty.

P8-9: Sections 4.3 and 4.4 could be subsections of 4.2; similar to the subsections of section 4.5

P9, L28ff: Section 4.4 would fit better at the end of section 4.2

P10, L9: The term "differential slant column" should be already introduced in Section 4.2, because it makes the usage of the reference spectrum clearer.

P11, L8ff: Please state temporal and spatial resolution of the BRDF product.

P11, L14: Please give a number for "a few percent".

P12, L4ff: How large is the SCD uncertainty due to uncertainties in the spectral calibration?

P18, L10: Replace "more diffuse" with "nosier".

P19, L9: Please give a number for "a few percent".

P20, Figure 7: The figure is very crowded and error bars are not explained for GCAS and missing for P-3B (extrapolation errors?).

P21, L 8-10: The sentence is very vague. Could you provide numbers?

3   Technical corrections

P10, L5: maybe replace "absorber" with "trace gas"

P10, L7: add a "," after "atmosphere"