

Interactive
Comment

Interactive comment on “GOME-2 observations of oxygenated VOCs: what can we learn from the ratio glyoxal to formaldehyde on a global scale?” by M. Vrekoussis et al.

Anonymous Referee #1

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General Comments: This paper shows a quite nice analysis of GOME-2 HCHO and CHO.CHO vertical columns, and in particular of their ratio and its potential use for distinguishing common surface emission sources. I think the manuscript warrants publication in Atmos. Chem. Phys. after my comments have addressed.

Abstract (line 11): Typo, misplaced ‘)’ after tropical forests.

Introduction (Page 19033, line 9): Typo, ‘access’ should be replaced by ‘assess’.

Introduction (Page 19033, line 21): The Amazon rainforest is ‘remote’ but can have high HCHO (>10ppb) mixing ratios. Do the authors mean ‘remote marine atmosphere.’

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Introduction (Page 19034, line 6): Primary sources may be considered small (or negligible) on a global scale but can have a large effect regionally and locally.

The GOME-2 Instrument (Page 19036, line 9): Typo, replace ‘nearly’ with ‘near’.

Methods – Data retrieval (Page 19037, line 18): The author’s state there was no further correction for residual clouds. However, in the air mass factor (AMF) calculation, are AMFs computed for both clear and cloud conditions (based on retrieved cloud properties) so that the final AMF is weighted combination of both (i.e. as proposed by Martin et al, JGR, 2002 doi:10.1029/2001JD001027)?

Methods – Data retrieval: How is the RGF affected by (a) differences in the shape of the HCHO and CHO.CHO profiles and (b) their relative vertical distribution to aerosols? Can a lot of the variation in the RGF (which is very sensitive) be explained by aerosols impacting the photon light path?

Global picture of HCHO and CHO.CHO (Page 19038, line 5): How have these composite maps (or rather two-year averages) been produced? What was the grid resolution, and what data filtering or smoothing has been applied?

Global picture of HCHO and CHO.CHO (Page 19038, line 16): Surely high HCHO columns ($>2 \times 10^{16}$ molecules cm^{-2}) must be observed over the south eastern US in summertime? These cannot be considered ‘moderate’.

Comparison of GOME-2 and SCIAMACY values (Page 19039, line 26): Why was 20S chosen as the southern limit?

Comparison of GOME-2 and SCIAMACY values: Why is the poorest agreement consistently over Europe?

Ratio RGF – “CHO.CHO to HCHO” (Page 19041, line 41): The sentence: “In addition it was observed that regions characterized as polluted (e.g. northeast China) experience lower RGF values than those dominated by influence.” is confusing, i.e. dominated by the influence of what? I assume pollution but please make it clearer.

Ratio RGF – “CHO.CHO to HCHO” (Page 19041, line 41): Are there any seasonal patterns in the RGF, or is the data too noisy so that only yearly means can be interpreted?

Error Analysis (Page 19042, eqns 1 and 2): Please clarify how are ‘x’ and ‘y’ determined? What is the error on these terms?

Error Analysis (Page 19042, eqn 3): Is there an equal sign missing? For example should this read: $RGF = [CHO.CHO]/[HCHO] = a / b$

Error Analysis (Page 19042, line 19): Is the spatial resolution of the coarse grid equal to D multiplied by the spatial resolution of the finer grid?

Error Analysis (Page 19043, lines 13-21): This last paragraph is slightly confusing in terms of how they have calculated the errors. Could the authors make this clearer?

Error Analysis (Page 19043, line 21): Typo, there are not any 3.4.1 and 3.5.2 sections.

RGF and emission sources (Page 19045, line 9): Please add an appropriate reference for the AATSR fire counts.

RGF and anthropogenic emissions (Page 19046, line 9): Again, could aerosols be influencing the ratio over urban areas instead of changes in HCHO and CHO.CHO production from their precursor emissions?

RGF and biogenic emissions (Page 19047, line 17): Isn't it how fast the emitted precursors are oxidised rather than ‘more CHO.CHO is released to the gas-phase than HCHO’? I think this is slightly misleading.

RGF and biogenic emissions (Page 19047, lines 23-26): Typically as the EVI increases to larger values it is more representative of pristine and mostly forest covered regions. It should come as no surprise then that the NO₂ should decrease as well since the anthropogenic influence is much smaller (especially as the data have been filtered to remove the influence of biomass burning).

Figures 5 and 6: Would be much improved in colour rather than B/W. Figure 6, parts c

and f could be enlarged too.

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