New glyoxal and formaldehyde products from multiple satellite instruments

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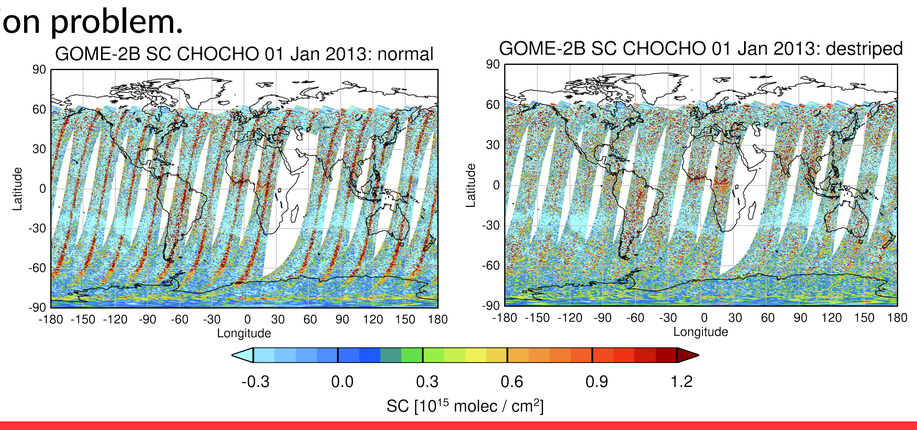
1. Introduction

- Glyoxal and Formaldehyde are intermediate products in the oxidation process of most VOC.
- Similar to other VOCs, glyoxal and formaldehyde are mainly emitted from natural and anthropogenic sources, as well as from wildfires.
- Formaldehyde and glyoxal abundances can be retrieved from space-borne instruments by using the DOAS method.
- This study focuses on a new homogenized glyoxal and formaldehyde product using AMFs computed based on profiles simulated with the TM4-ECPL chemistry transport model.
- This retrieval algorithm is applied to (a) the OMI, and (b) the two GOME-2 (on MetOp-A and -B).
- The combination of three instruments provides more than 10 years of measurements.
- Glyoxal and formaldehyde can be used for the investigation of the temporal and spatial variability of VOC on a global scale.

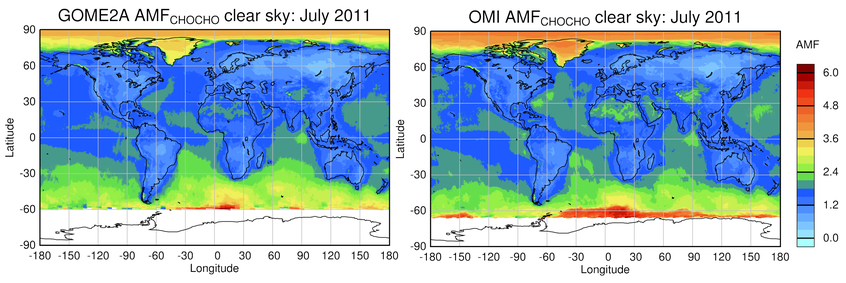
3. Destriping correction

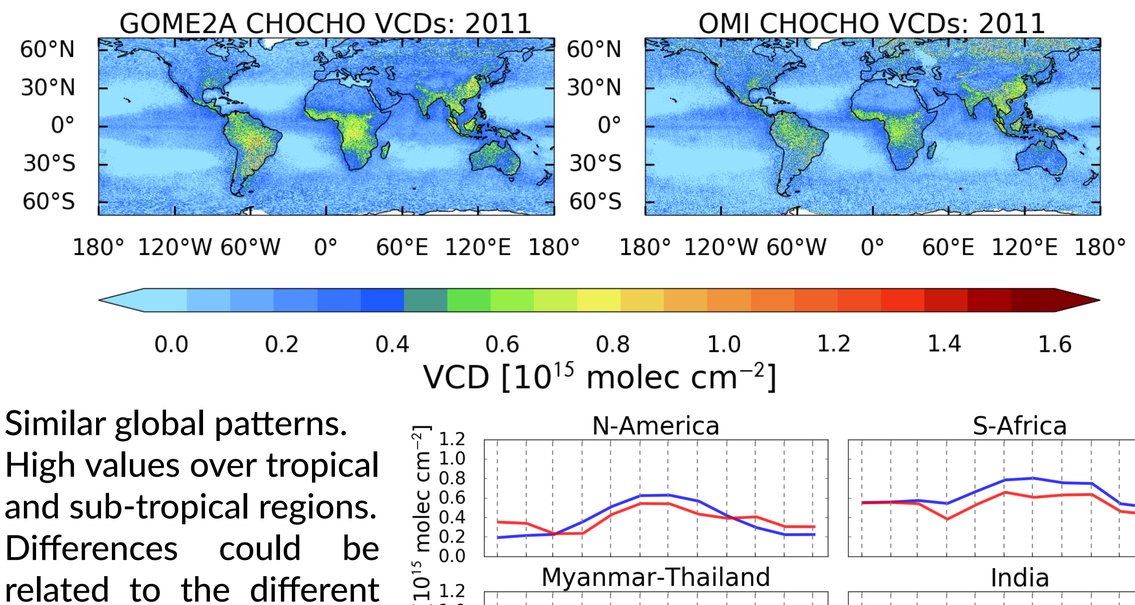
- A destriping correction is implemented in the CHOCHO retrieval to reduce the stripe introduced in the central scan of GOME-2 data due to a calibration problem.



4. CHOCHO VCs comparison

- The AMF LUT is simulated with SCIATRAN for conversion of the SCs to VCs using the profiles simulated by TM4-ECPL model.





- Similar global patterns.
- High values over tropical and sub-tropical regions.
- Differences could be related to the different overpass times.
- The amplitude depends on the dominant source of emission in the region.

5. Summary

- Improved and homogenized glyoxal and formaldehyde retrievals have been developed for three instruments, which expands the dataset available to more than 10 years from morning and afternoon orbits.
- New AMFs have been computed based on profiles simulated with the TM4-ECPL Global 3D Model.

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2. Retrieval description

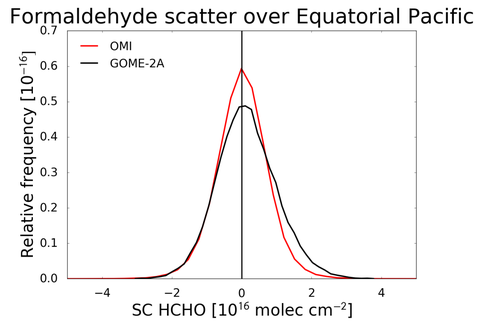
- Parameters used in the retrievals are summarized in the table below.

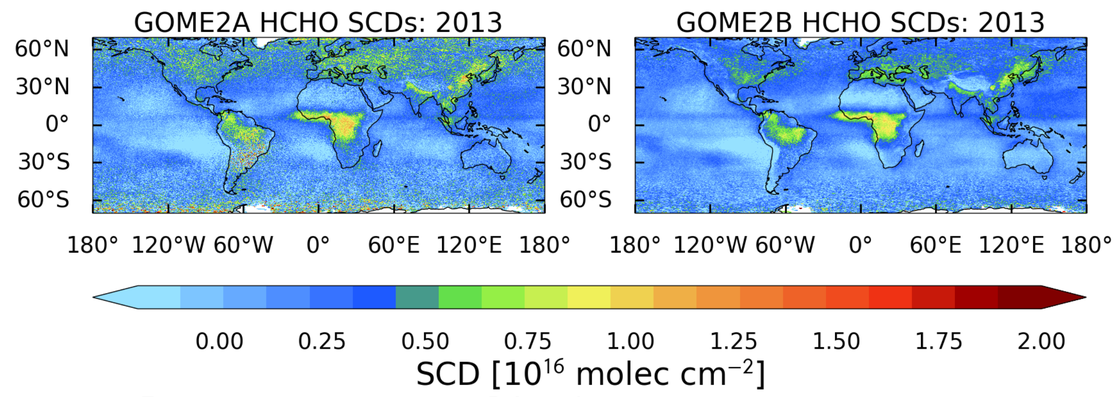
Parameters	CHOCHO	HCHO
Fit window	433-460 nm	323.5-361 nm
Polynomial order	4	5
Offset	Linear	Linear
Cross-sections	CHOCHO, O_3, NO_2 (220 K and 298 K), O_4, $H_2O_{vap.}$, liq. water, Ring	HCHO, O_3 (223 K and 243 K), NO_2, BrO, O_4, Ring

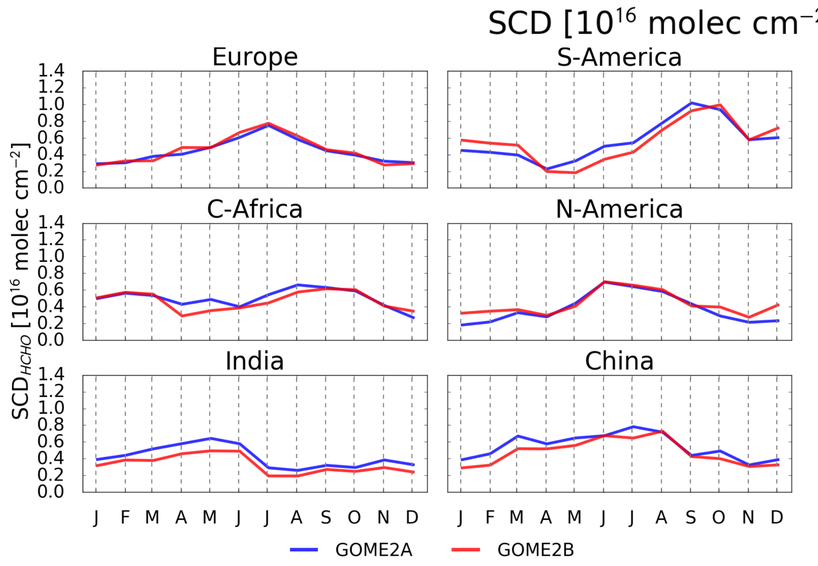
- Reference spectrum: daily average of radiances selected in the equatorial Pacific.
- Two pseudo cross-sections from the Taylor expansion are used for account the non-linear O_3 absorption effect in HCHO retrieval.
- An iterative spike removal is applied to both retrievals.
- Background correction over the Pacific (50° S–50° N, 160–220° E) is applied to glyoxal and and reference sector correction (90° S–90° N, 160–220° E) to formaldehyde.
- A pseudo cross-section to account for the effect of variation of slit function (resolution correction) is included.
- An empirical correction minimizing of the scan angle dependence in the GOME-2 instruments is applied.

3. HCHO SCs comparison

- Comparison of SCDs over a clean region over the equatorial Pacific (5° S-5° N, 160-200° E) for August 2011 is shown.
- The scatter of the GOME2A SC values is larger for OMI, which is the result of the higher spatial resolution of the instrument.







- The results from GOME-2A show more scatter in the values most likely due to degradation in the instrument.
- Both have similar pattern and temporal variability.

6. Selected references

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7. Acknowlegements

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