# Comparison of OMI and GOME-2 CHOCHO columns since 2007

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## 1. Introduction

- Glyoxal (CHOCHO) is the smallest of the alpha-dicarbonyls and the most abundant in the atmosphere. CHOCHO is an intermediate product in the oxidation of most VOCs and an indicator of secondary aerosol formation in the atmosphere. The main sources of CHOCHO are emissions by plants, vegetation fires, and fuel combustion.
- CHOCHO columns can be determined by remote sensing using the Differential Optical Absorption Spectroscopy (DOAS) method. Glyoxal has been previously retrieved from SCIAMACHY and GOME-2 data at IUP-Bremen, MPI-Mainz, IASB-Brussels and from OMI spectra at SAO-Massachusetts. However, the results still have a large uncertainty and inconsistencies are found between data sets..

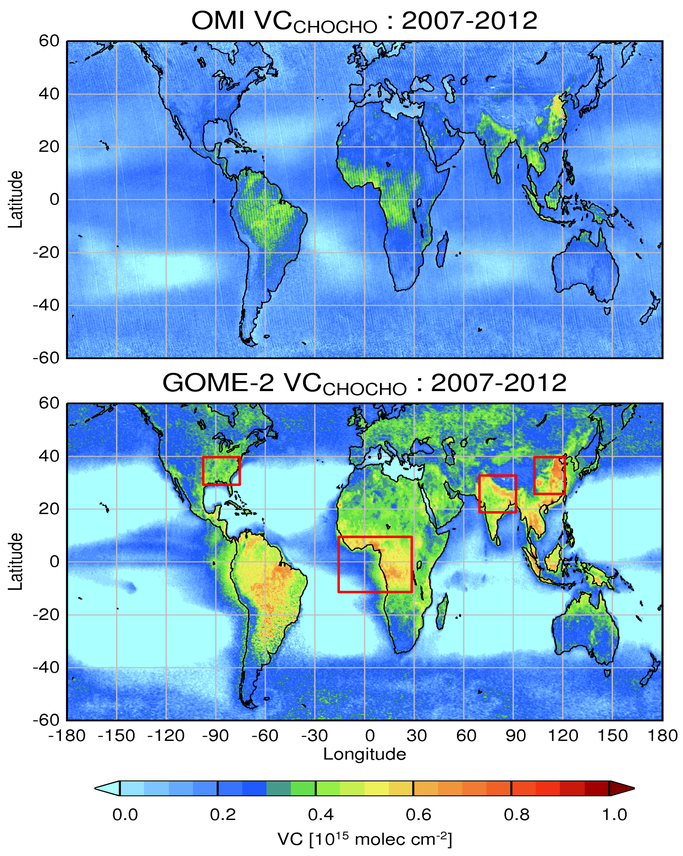
This study focuses on the detailed comparison between glyoxal columns retrieved from OMI and GOME-2 measurements using an improved retrieval developed by Alvarado et al. (2014). The comparison is performed over regions with different type of source of glyoxal investigating the geographical and temporal behavior from 2007 to 2012.

## 2. Glyoxal retrieval

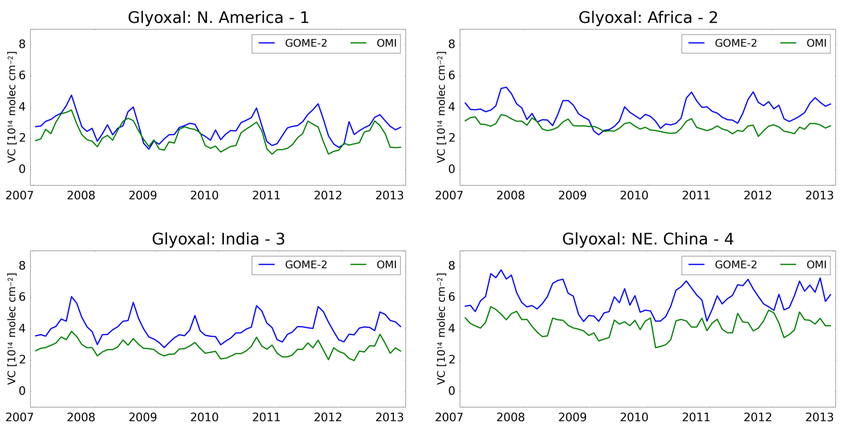
- The DOAS method, based on absorption spectroscopy, allows for the determination of atmospheric trace gases with narrow absorption bands in the ultraviolet and visible.
- The retrievals include $O_3$, $NO_2$, water vapour, $O_4$ ($O_2$-$O_2$ collision), a pseudo absorber cross-sections for the correction of the Ring effect, and a polynomial of order 3 for the removal of broad band signatures.
- For the CHOCHO retrieval the optimal fitting window of 433-458nm has been used.
- A liquid water cross section has been included over oceanic regions to reduce the possible interferences (only for OMI).
- An additional $NO_2$ high-temperature cross-section has been included in the retrieval, in order to reduce the interferences over large agglomerations dominated by enhanced $NO_x$ emissions.
- A normalisation over the Pacific region is applied and air mass factors has been used for convert to vertical column (VC). For more details see Alvarado et al., 2014.

## 3. Glyoxal comparison from GOME-2 and OMI measurements

- Global maps of OMI and GOME-2 CHOCHO VCs are compared.

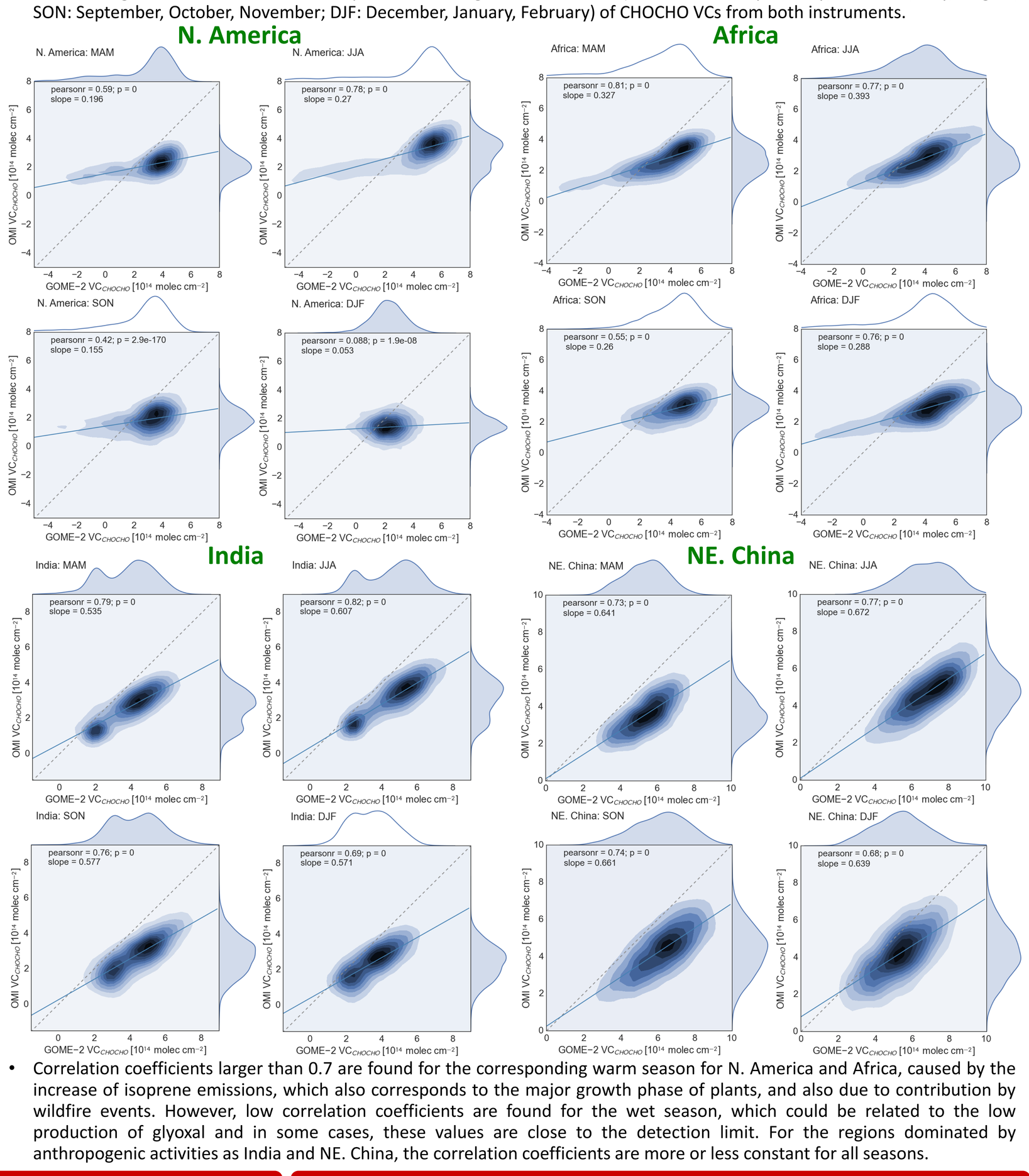



- High values over tropical and sub-tropical regions, mainly over regions with biomass burning and biogenic activities are observed. In addition, large amounts are identified in areas of anthropogenic activities.
- Time series of glyoxal from both instruments over four selected regions (N. America, Africa, India, and NE. China; red boxes) have been computed.




- Similar temporal behavior is observed for OMI and GOME-2 CHOCHO VCs but less pronounced for OMI. Good agreement is found over N. America and to a lesser degree for the others three regions. In all cases, OMI VCs are lower than those from GOME-2. Some differences between the instruments could be related to the different overpass times and variations can also be introduced by different instrumental features, and to a lesser degree the absence of liquid water correction in GOME-2 retrieval.

- Correlation plots are determined by assuming a linear relationship between OMI and GOME-2 CHOCHO VCs for the four selected regions. The calculations were performed using seasonal means (MAM: March, April, May; JJA: June, July, August; SON: September, October, November; DJF: December, January, February) of CHOCHO VCs from both instruments.




- Correlation coefficients larger than 0.7 are found for the corresponding warm season for N. America and Africa, caused by the increase of isoprene emissions, which also corresponds to the major growth phase of plants, and also due to contribution by wildfire events. However, low correlation coefficients are found for the wet season, which could be related to the low production of glyoxal and in some cases, these values are close to the detection limit. For the regions dominated by anthropogenic activities as India and NE. China, the correlation coefficients are more or less constant for all seasons.

## 5. Summary and Outlook

- The preliminary comparison of OMI and GOME-2 glyoxal columns has been performed globally as well as specific regions with large production of VOC. The highest glyoxal values are found over regions with large biogenic, fire and anthropogenic emissions.
- Similar temporal variability is observed for both instruments. However, the OMI CHOCHO values are systematically lower than the GOME-2 glyoxal columns and the seasonal behavior is less pronounced.
- Correlation coefficients larger than 0.7 have been found over N. America and Africa during the warm season due to the large biogenic activity and fire events in this period. For NE. China and India the correlation coefficients are similar for all season most likely due to large anthropogenic emissions being dominant.
- Further improvements including the liquid water correction to GOME-2 retrievals and consistency are needed to make full use of the synergy between measurements from instruments with different overpass time.

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