

# Elevated glyoxal concentrations over equatorial Pacific

Ruixiong Zhang<sup>1</sup>, Yuhang Wang<sup>1</sup>, Christophe Lerot<sup>2</sup>

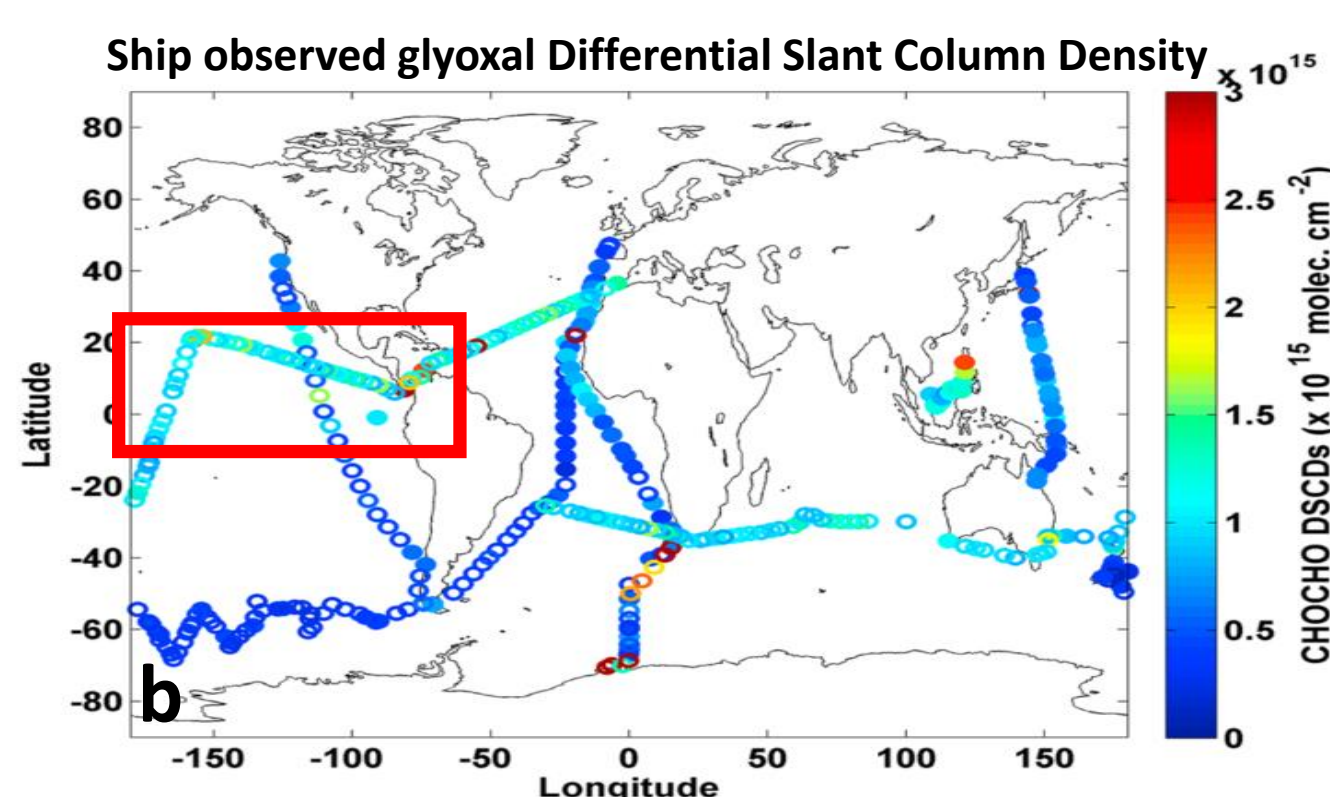
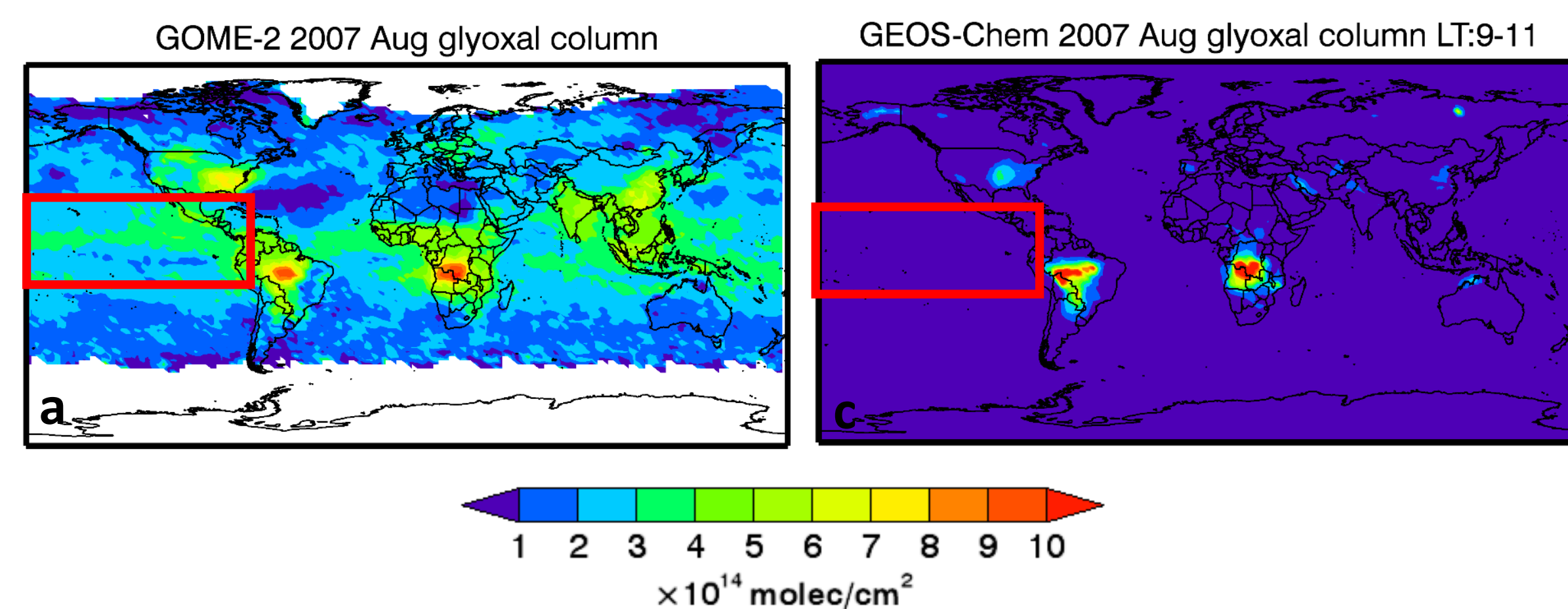
<sup>1</sup>School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA, USA

<sup>2</sup>Belgian Institute for Space Aeronomy, Brussels, Belgium

## Summary

Both satellite retrievals and ship observations have reported elevated glyoxal (CHOCHO) which is not captured by current atmospheric chemistry models. This study aims to investigate on the sources and strength of this unknown glyoxal emission. Bimodal seasonal cycle of observed glyoxal coincides with that of  $\cos(\text{SZA})$  and phytoplankton division rate ( $\mu$ ) indicating a possible biogenic source. Also, satellite retrieved glyoxal to formaldehyde (HCHO) ratio is around 0.1, above the range of 0.04-0.06 for continental biogenic areas. The top-down emission using GEOS-Chem estimates that about 20Tg/yr glyoxal direct surface emission is needed for such glyoxal concentration because of the solubility. Taking the strong convection in tropical Pacific into account, we suggest that the enhanced glyoxal concentration may result from a lifted precursor on a higher level rather than at sea surface. Future research will focus on the possibility of this assumption and estimating the emission and subsequent SOA production.

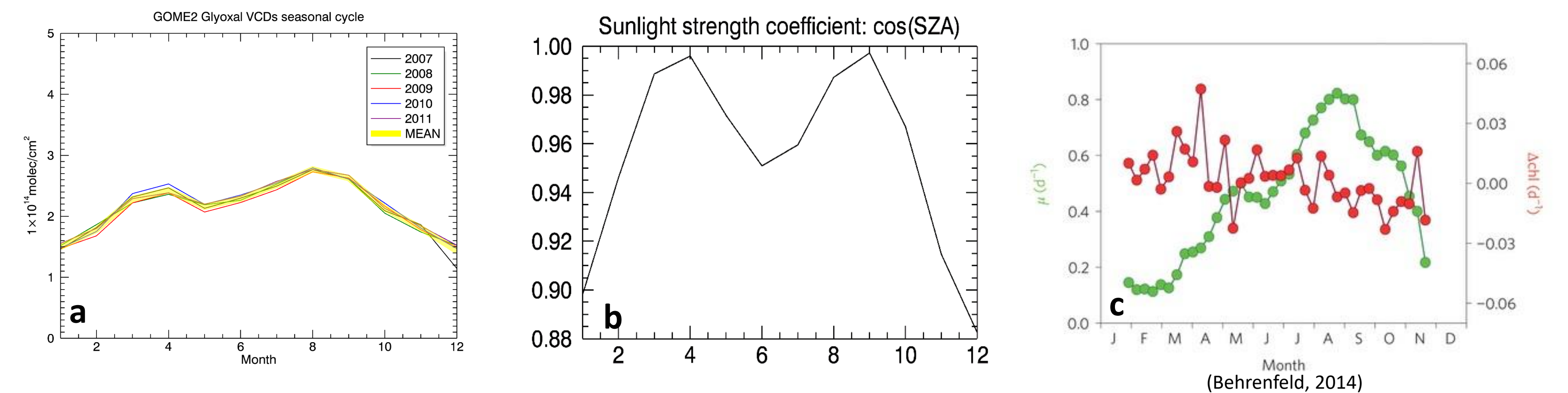
## Satellite and Ship Observations



(Mahajan et al., 2014)

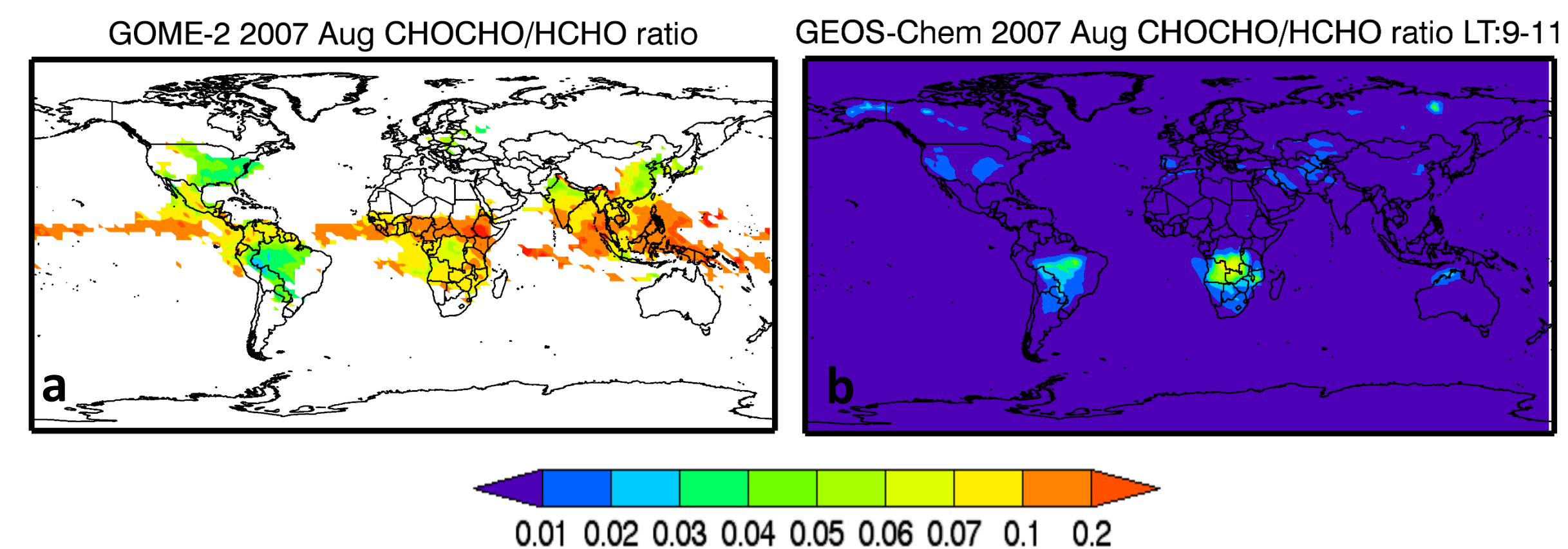
Satellite (a) and ship observation (b) capture elevated glyoxal in eastern equatorial Pacific (red region) while model (c) can not.

## Seasonal Cycle of Glyoxal VCDs



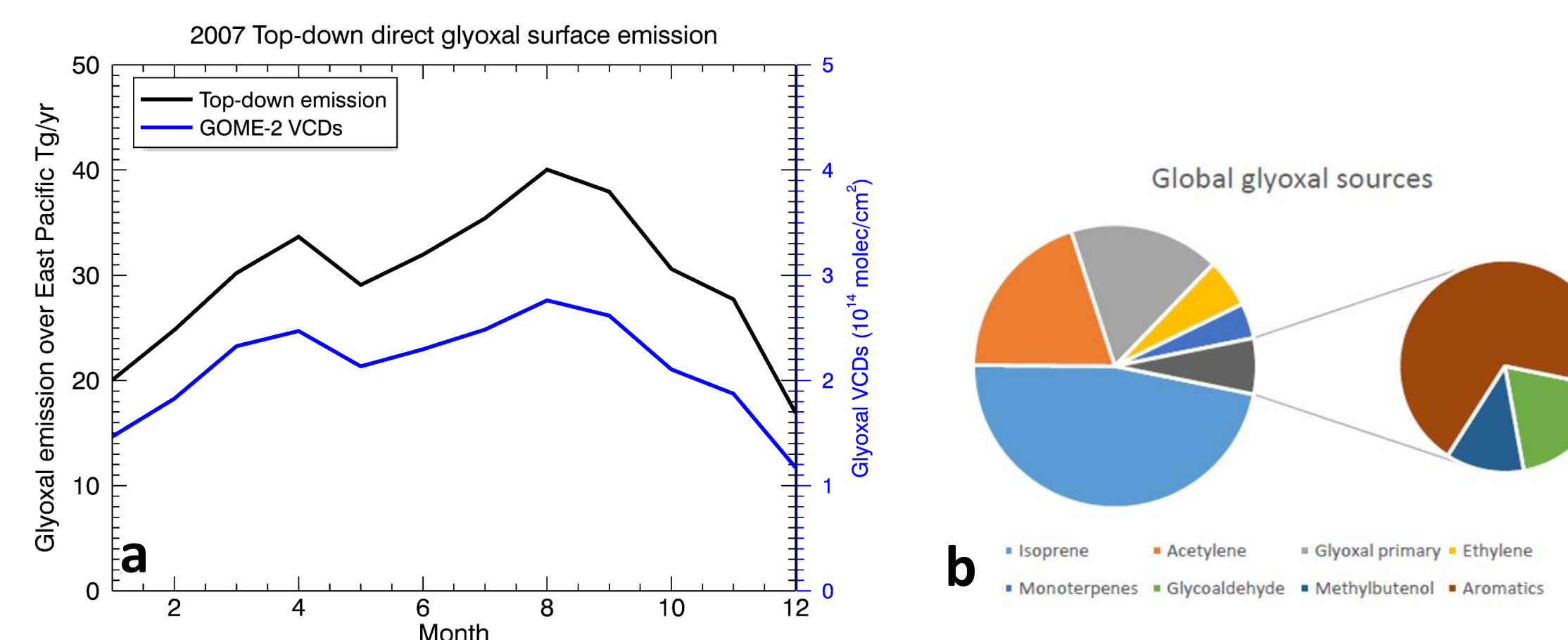
The mean glyoxal Vertical Column Densities (VCDs) in this region (a) has a bimodal seasonal cycle, coinciding with cosine of Solar Zenith Angle (b) and phytoplankton division rate (c). This indicates a possible link between biosphere and elevated glyoxal.

## CHOCHO/HCHO ratio ( $R_{GF}$ )



$R_{GF}$  is used as an indicator to classify anthropogenic and biogenic emission.  $R_{GF}$  below 0.040 indicates a anthropogenic source, while  $R_{GF}$  between 0.040 to 0.060 points to a biogenic source on land.  $R_{GF}$  over the region is above 0.10 overall.

## Preliminary results



If we assume a direct glyoxal emission at sea surface, the estimate emission will be 20-40Tg/yr (a) over the region, comparable to total continental emission (Fu et al., 2008).

As convection predominates the region and the lifted precursor can avoid rapid dissolving of glyoxal, we further assume that the convection of its precursors result in elevated glyoxal. This will be clarified in future research.