

Elevated Glyoxal Concentrations over the Eastern Equatorial Pacific



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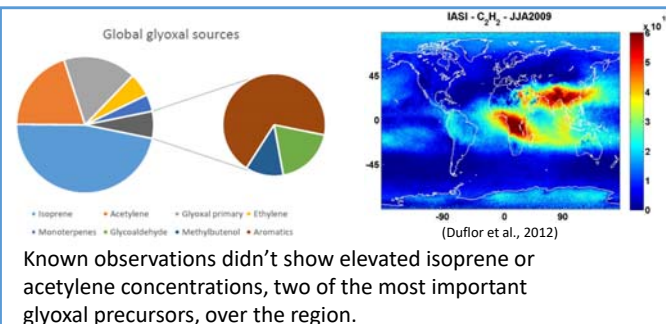
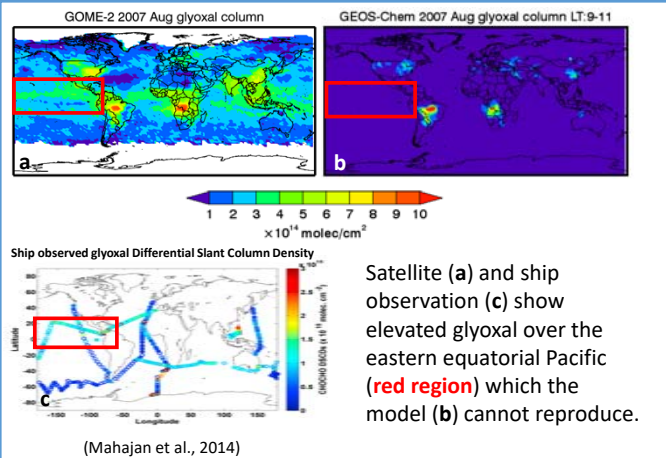
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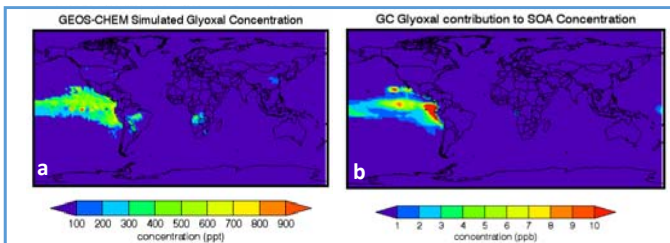
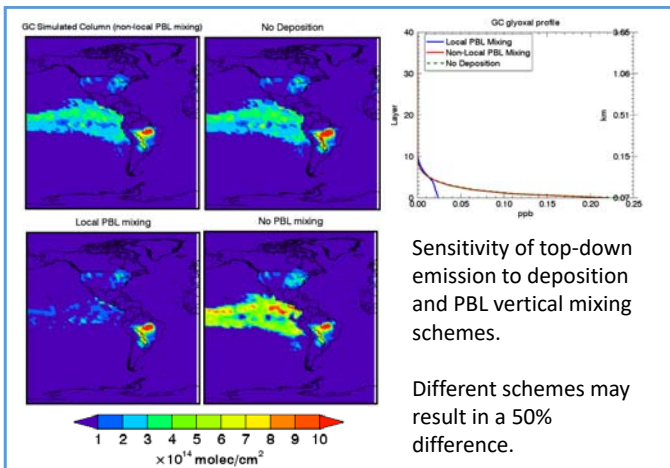
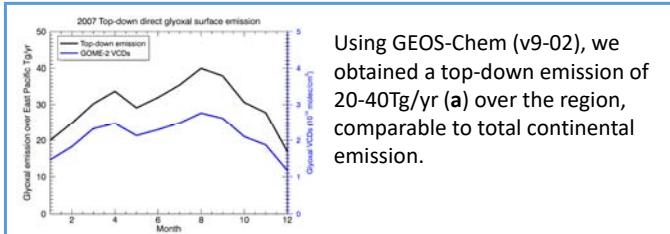
Summary

Both satellite retrievals and ship observations have reported elevated glyoxal (CHOCHO) levels over the equatorial Pacific, which are not captured by current atmospheric chemical transport models. This study aims to investigate the potential sources and strength of unknown glyoxal emissions. The top-down emission estimate using GEOS-Chem is that about 20Tg/yr glyoxal surface emission is needed for such glyoxal concentration. The bimodal seasonal cycle of observed glyoxal that coincides with that of $\cos(SZA)$ and phytoplankton division rate (μ) indicate a possible biogenic source. Satellite retrieved glyoxal to formaldehyde (HCHO) ratio is around 0.1, much higher than expected that due to anthropogenic emissions. Therefore, we suggest a strong unknown biogenic source of glyoxal presence.

Satellite and Ship Observations



Model results

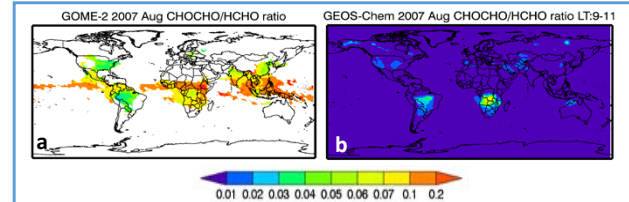


- We predicted 465 pptv at Christmas Island (1.9°N, 157.3°W) during the Atmospheric Sulfur Experiment (PASE), consistent with our unpublished study that up to 500 pptv of glyoxal is needed for the observed HO₂/OH profile.
- The simulated contribution of glyoxal to Secondary Organic Aerosols (SOA) over the region. The subsequent effect on radiative forcing is to be quantified.

Acknowledgement

This work is supported by the NASA ACPMAP Program.

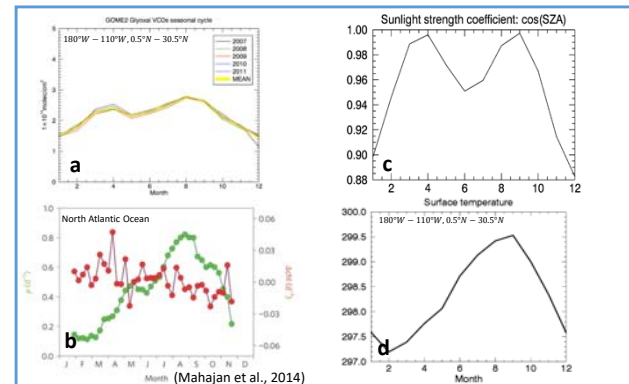
CHOCHO/HCHO ratio (R_{GF})



R_{GF} is used as an indicator to classify anthropogenic and biogenic emissions.

R_{GF} below 0.04 indicates a anthropogenic source, while R_{GF} between 0.04 to 0.06 points to a biogenic source on land. R_{GF} over the region is above 0.10 overall. Thus, we suggest an unknown biogenic source presence.

A biogenic source?



The mean glyoxal Vertical Column Densities (VCDs) in this region (a) has a bimodal seasonal cycle, coinciding with the cosine of Solar Zenith Angle at 5°N (c) and phytoplankton division rate (c). The asymmetry may result from sea surface temperature variation (d).

