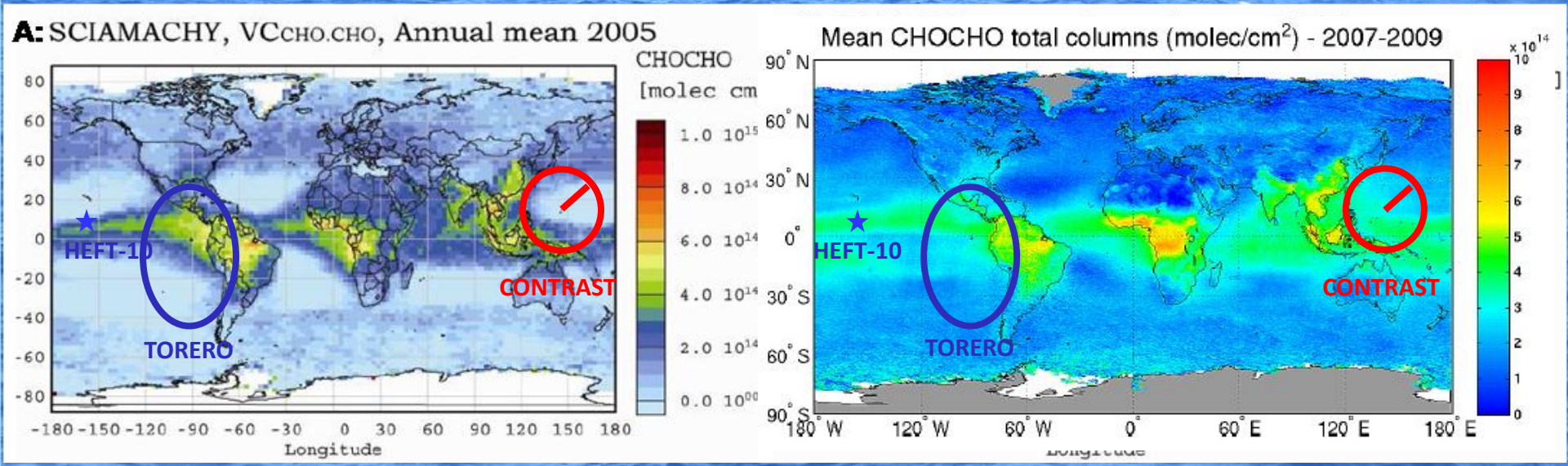
TORERO hypothesis #1: Glyoxal over oceans is a smoking gun for other oxygenated VOC and 'missing' sources from ocean biology.

Where does it come from, and what comes with it?
What do 4D measurements reveal about the source mechanism?

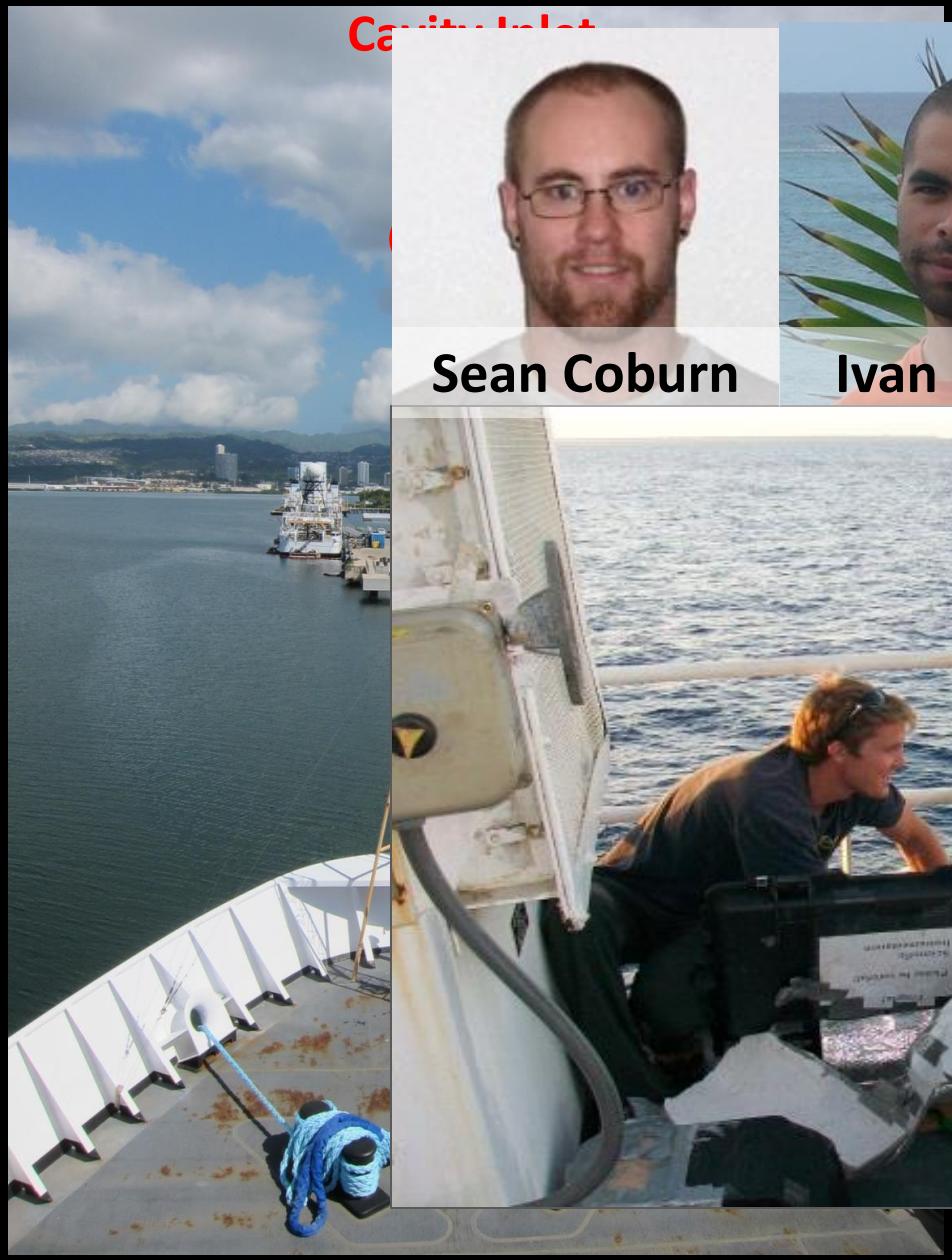


Wittrock et al., 2006; Myriokefalitakis et al., 2008; Sinreich et al., 2010; Lerot et al., 2010

Atmospheric models do not predict any glyoxal over oceans

CONTRAST relevance: OVOC are a sink for Br_x
CONTRAST study area: biological gradient, global background, day/night cycle

Fast Cavity Enhanced DOAS (CE-DOAS)



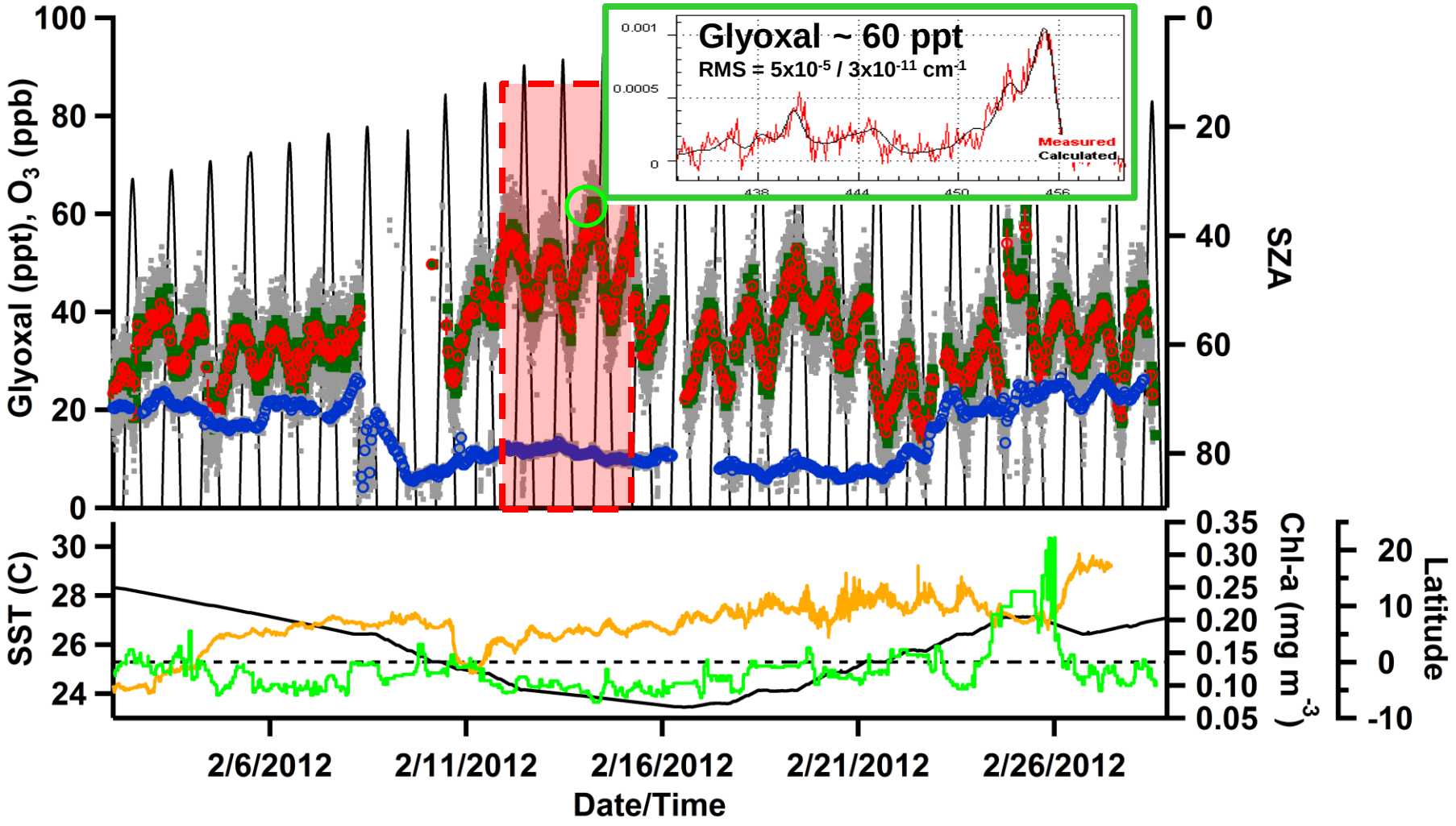
Sean Coburn

Ivan Ortega

Andrew Hattel

Cavity Rack

Glyoxal diurnal cycle over the remote ocean

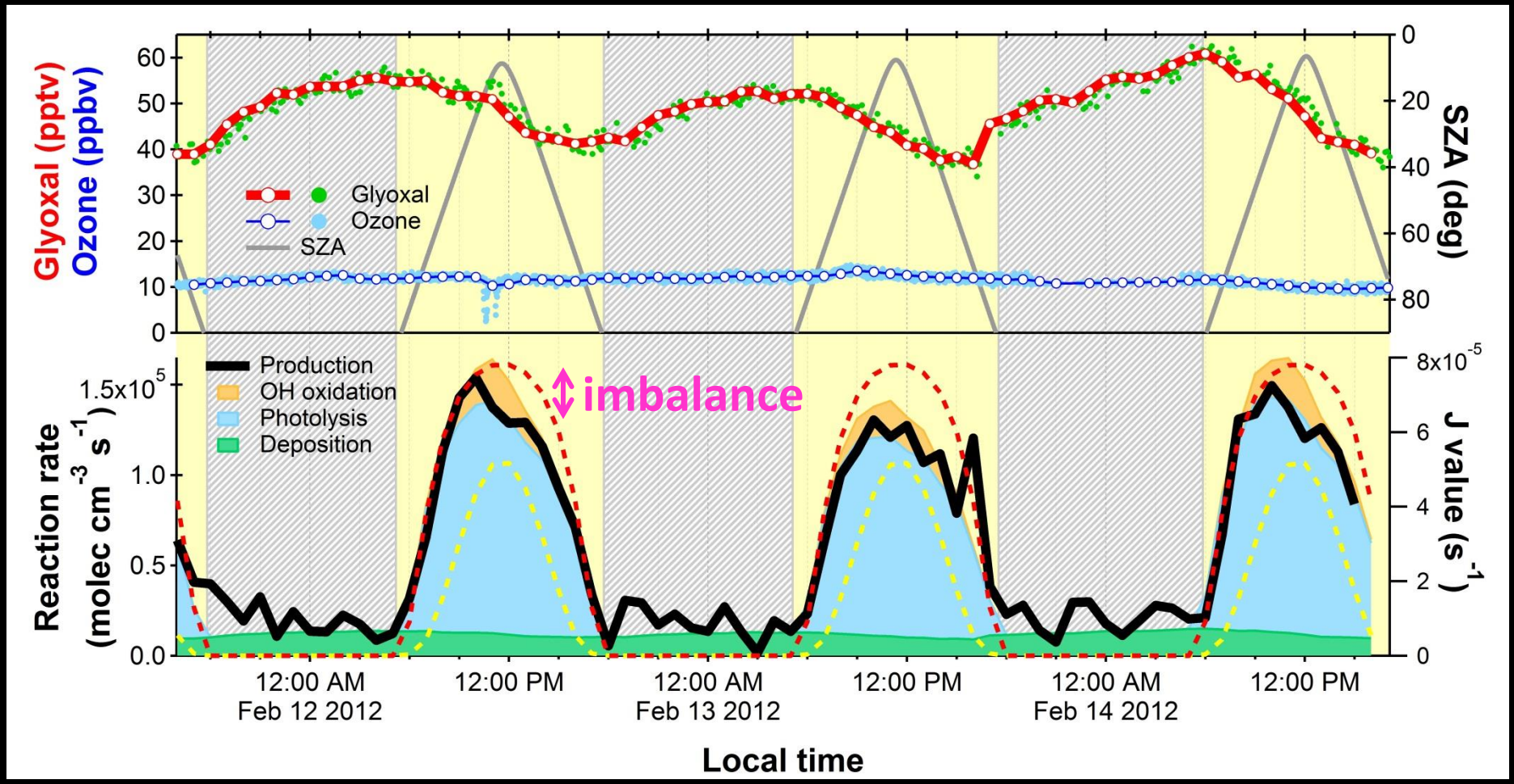


Distinct variations: ~ 10-20 ppt amplitude

Early morning maxima (30-60 ppt)

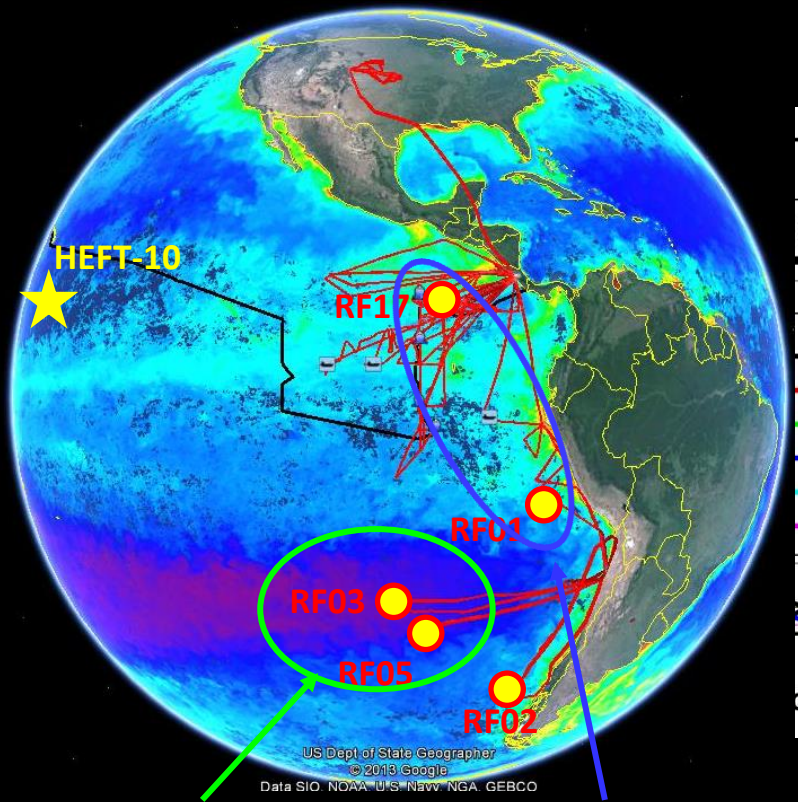
Latitude
Latitude (zero line)
Sea Surface Temperature
Chlorophyll-a

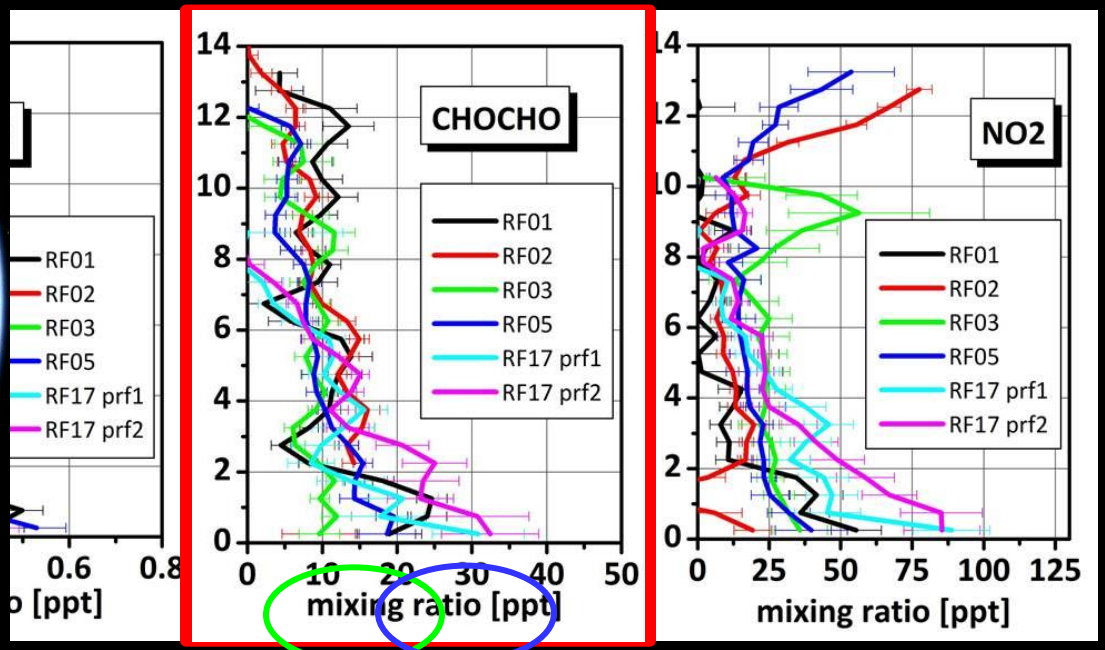
Diurnal cycle indicates dawn/dusk gradient



- Opportunity for dawn/dusk CONTRAST flight?
- -> ideally flight avoids pollution (ocean

Global non-biological background





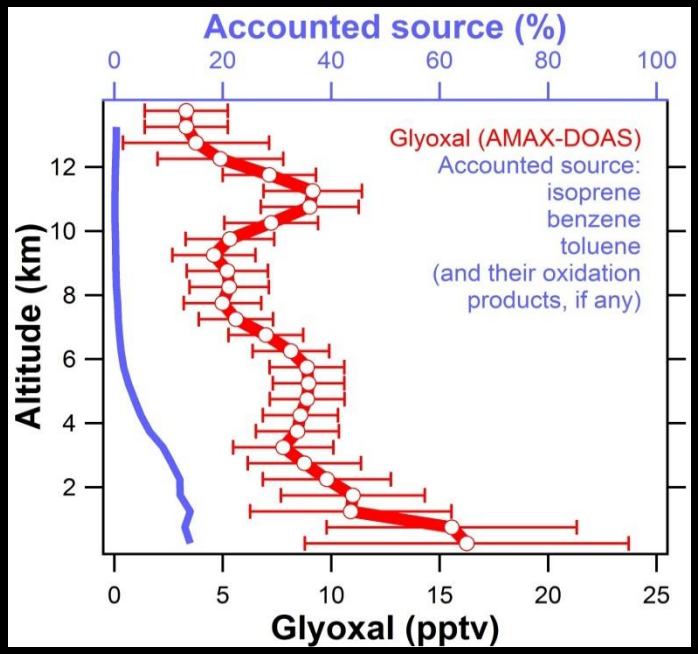
Chl-a < 0.02 mg/m^3 Chl-a ~ 0.2-0.5 mg/m^3

- Oligotrophic ocean: ~ 15 pptv (10-20 pptv)
- Mesotropic ocean: ~ 28 pptv (20-35 pptv)

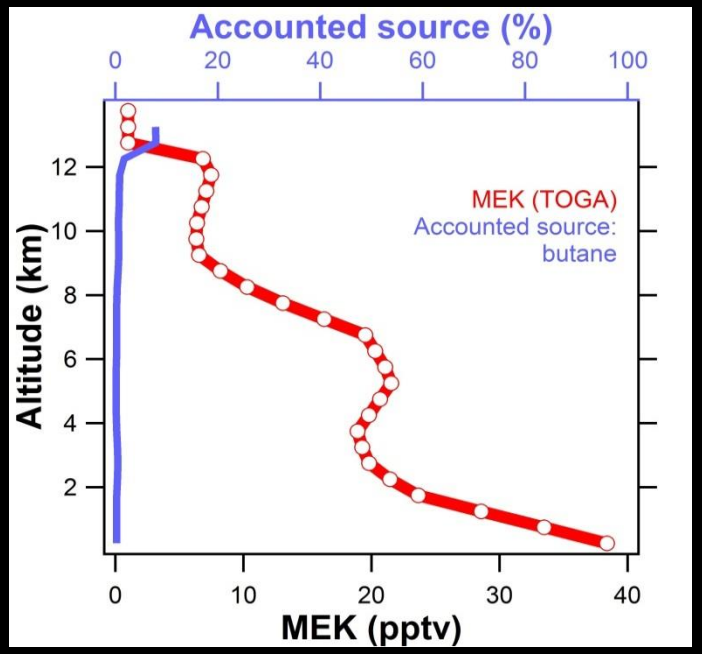
} **Ocean biology signature ?**

- FT: 5-15 ppt (Eastern) and 3-10 ppt (Central Pacific – HEFT-10)
- Stratosphere: < 3 pptv – no signal is detectable
- Glyoxal is widespread, possibly ubiquitous → a biogeochemical cycle

‘Pollution’ and ‘biogenic land’ sources complicate marine OVOC source



AMAX-DOAS (CU)



TOGA (NCAR)

OVOC are NOT explained by VOC precursors

Anthropogenic pollution creates convolution to the problem!

CONTRAST relevance: **OVOC are a sink for Br_x**

CONTRAST study area: **pristine MBL to North East ➔ non biological global background?; biological gradient?; day/night?**