

Halocarbons from the Peruvian upwelling system

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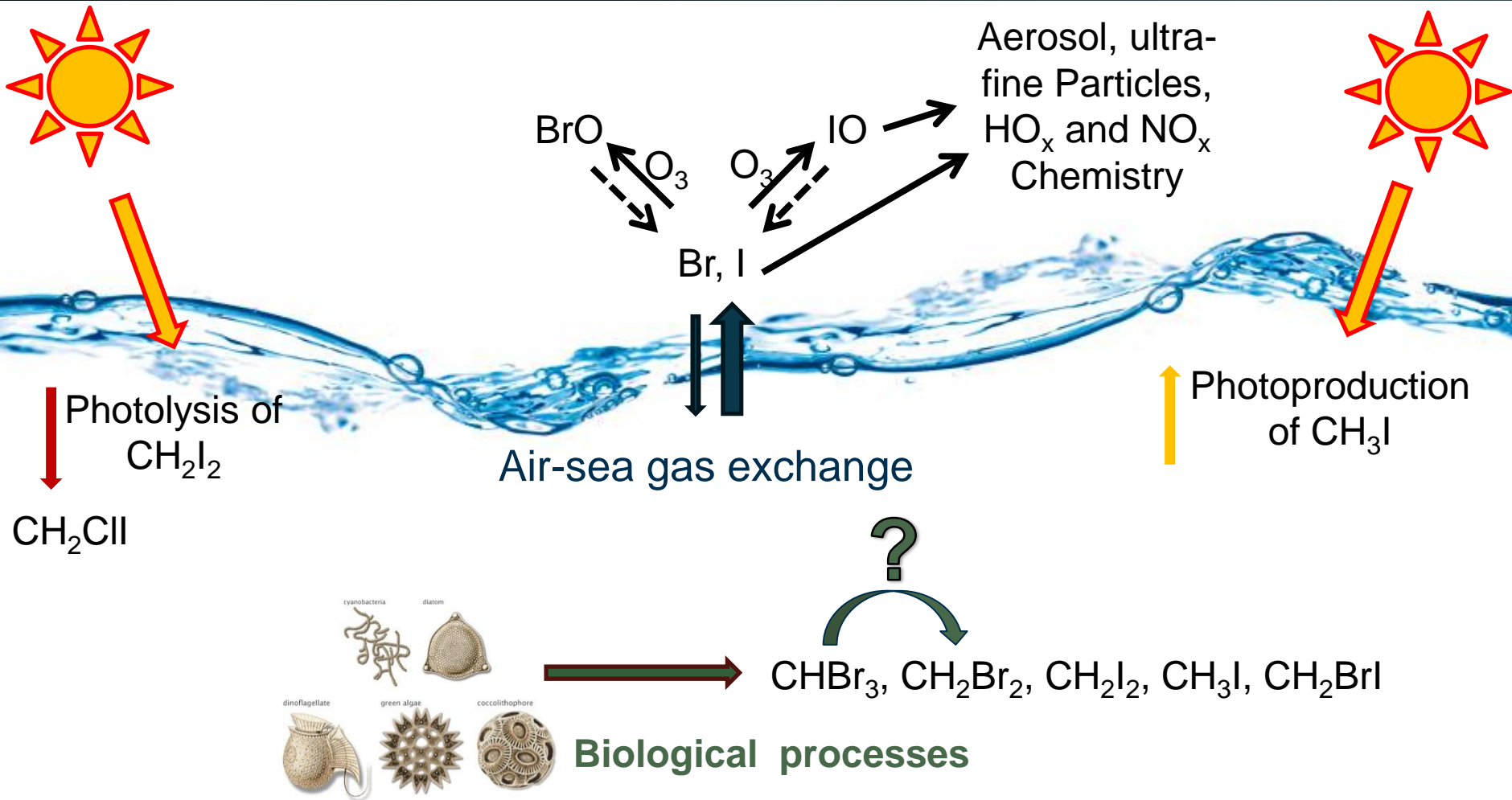
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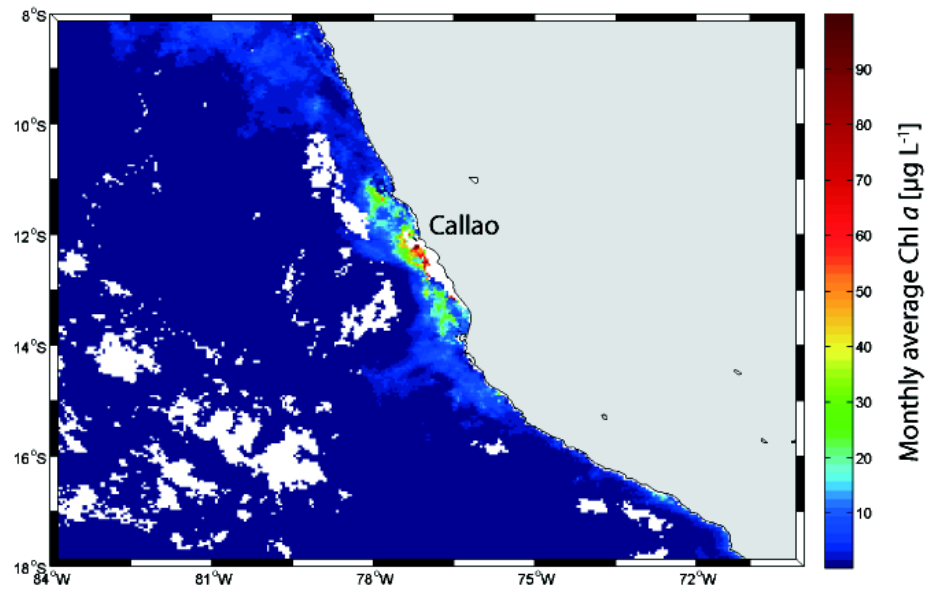
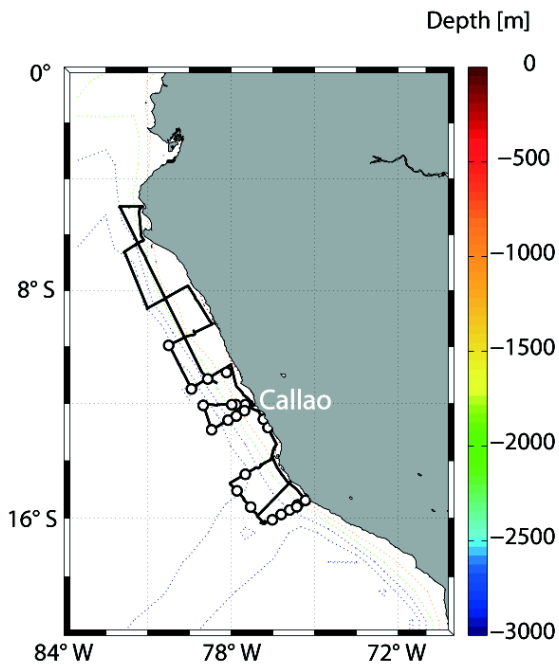
Halocarbons in the tropical ocean



The M91 cruise



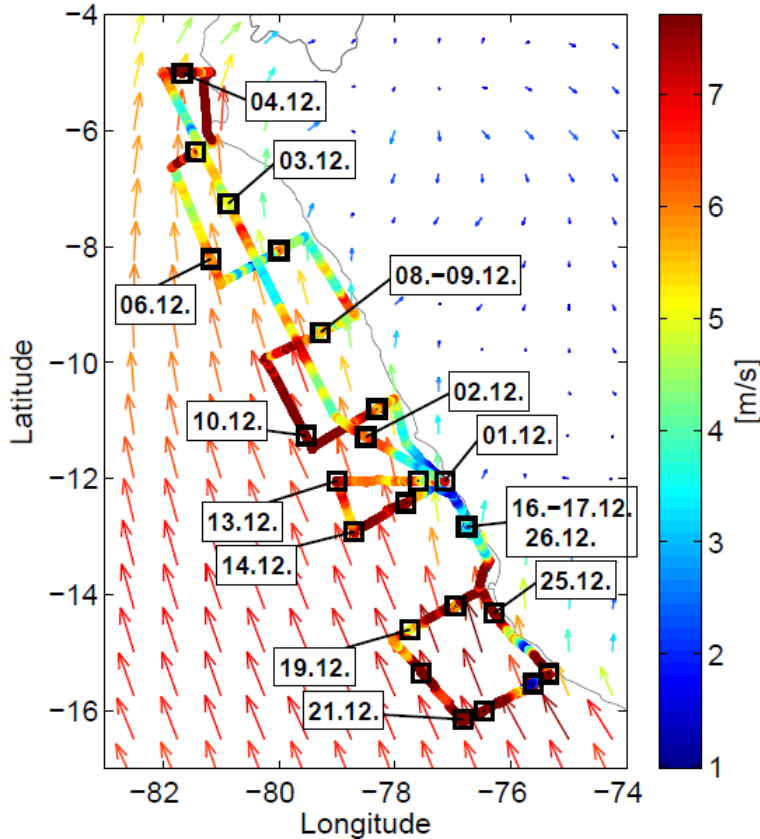
M91 (RV Meteor)
Callao, Peru to Callao, Peru
(December 1 – December 26 2012)



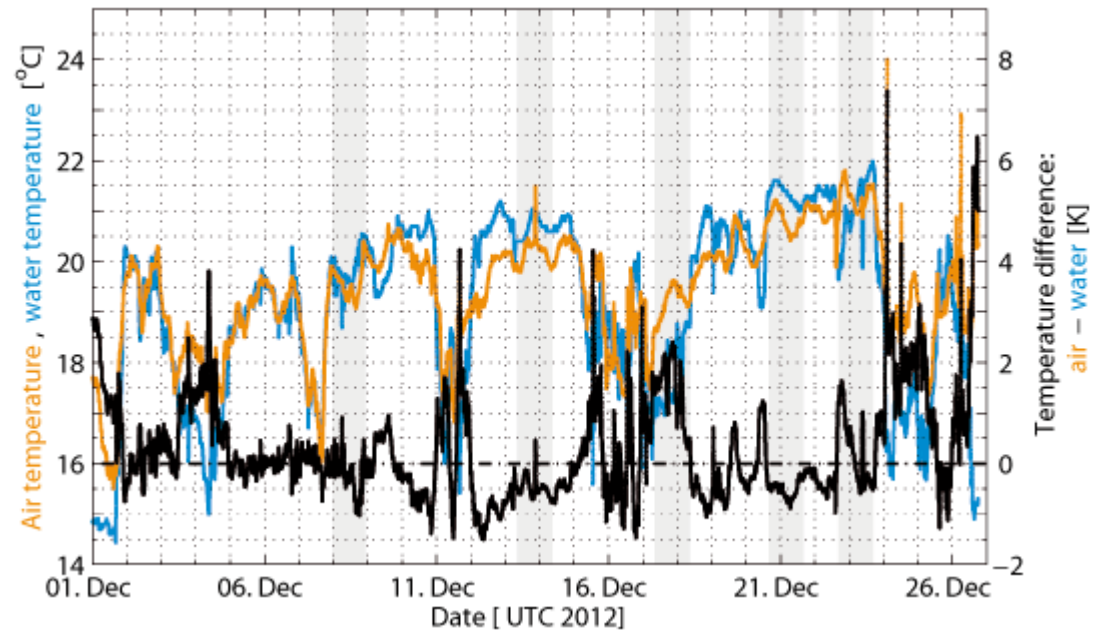
(MODIS Aqua data from December 2012)

Environmental conditions during M91

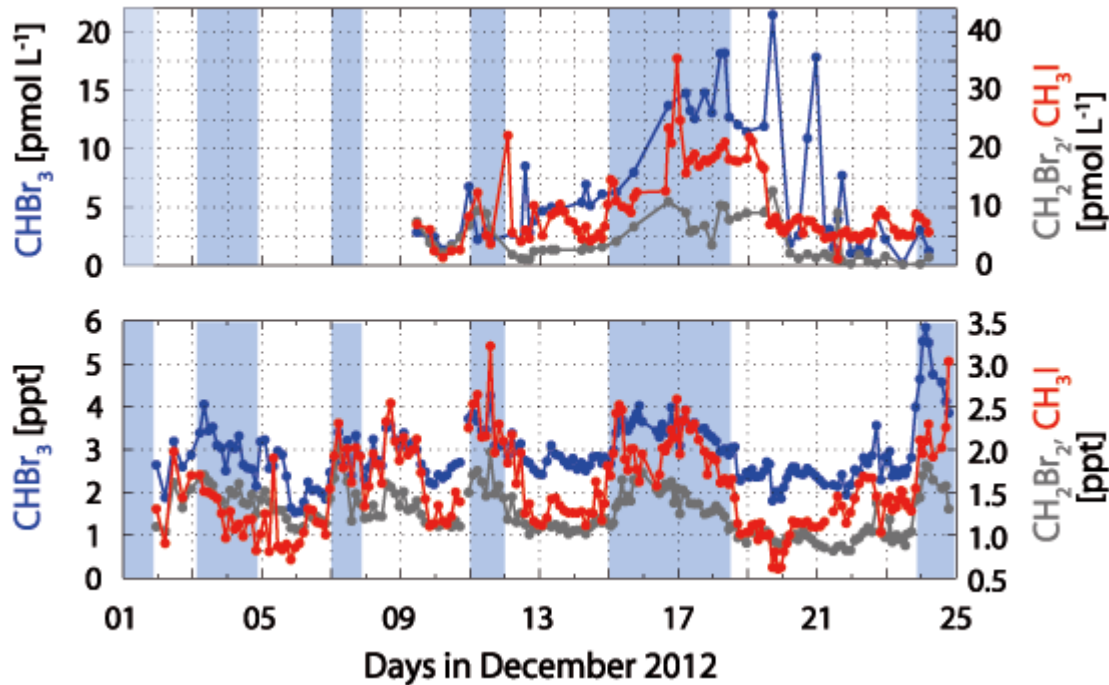
Wind speed



Air and water temperature, ΔT

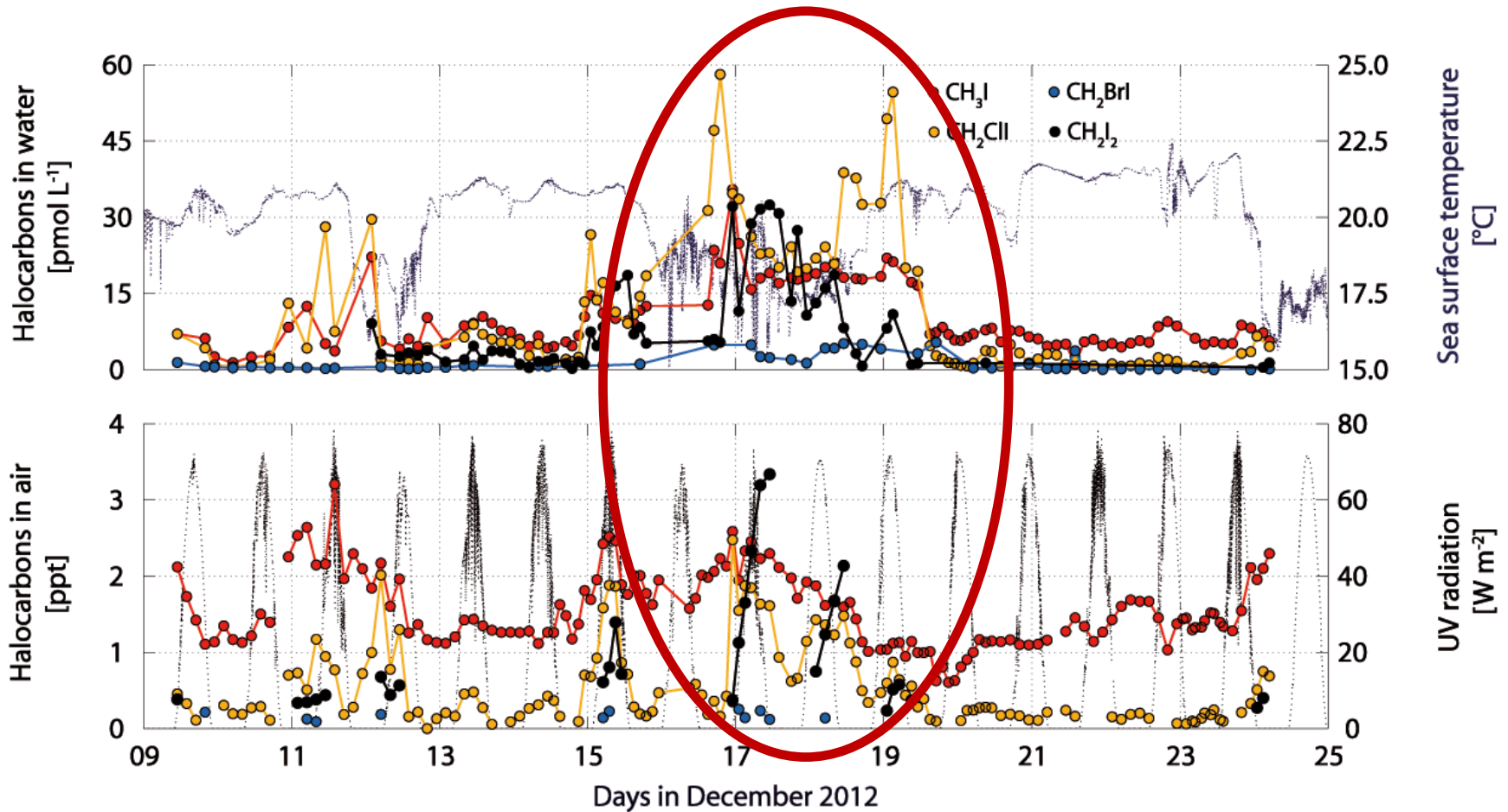


Halocarbons during M91

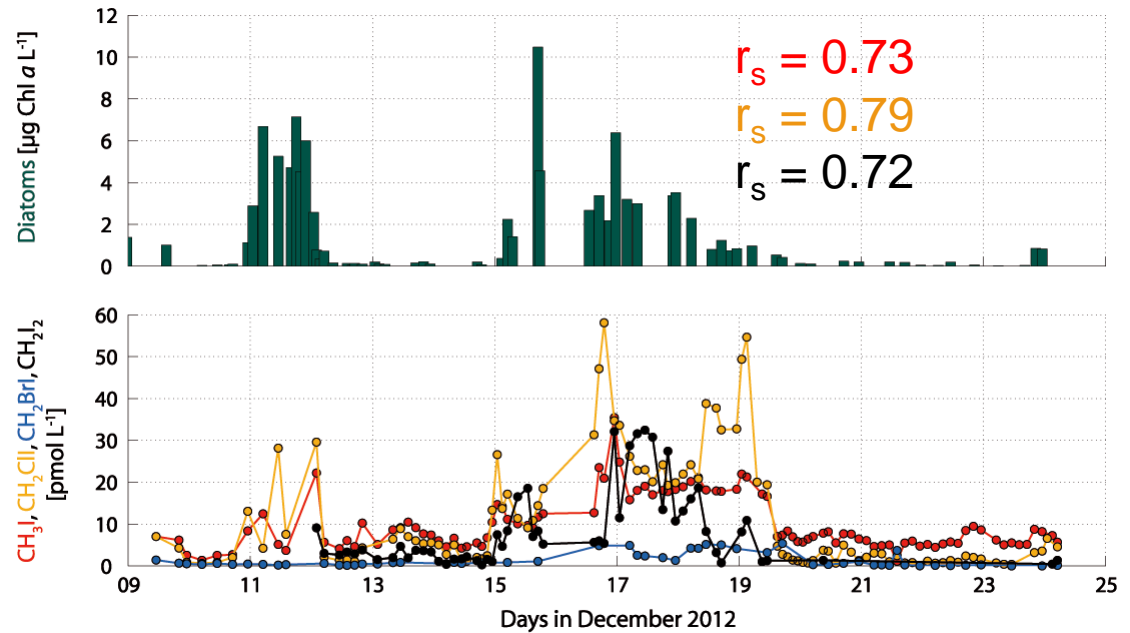
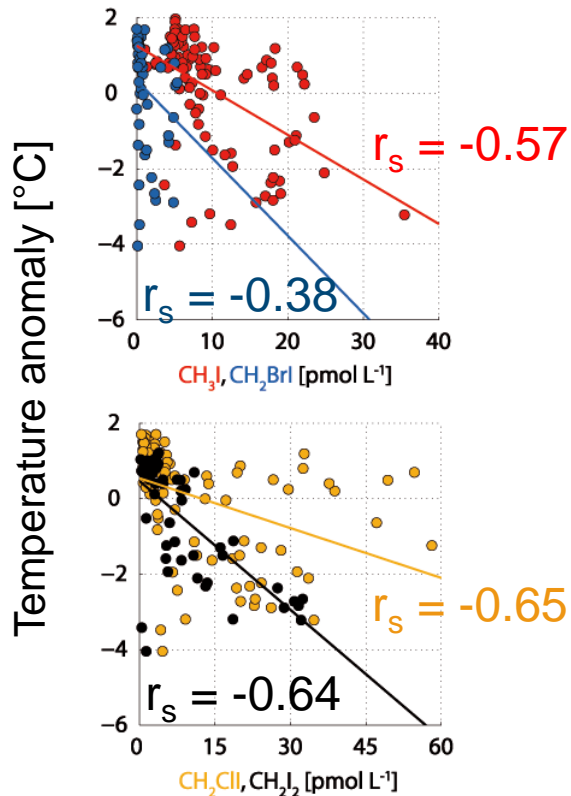


- Elevated atmospheric halocarbons above the upwelling
- Bromocarbons in surface water in comparison to other upwelling regions in moderate concentrations
- Higher CH_3I than CHBr_3

Iodocarbon surface concentrations

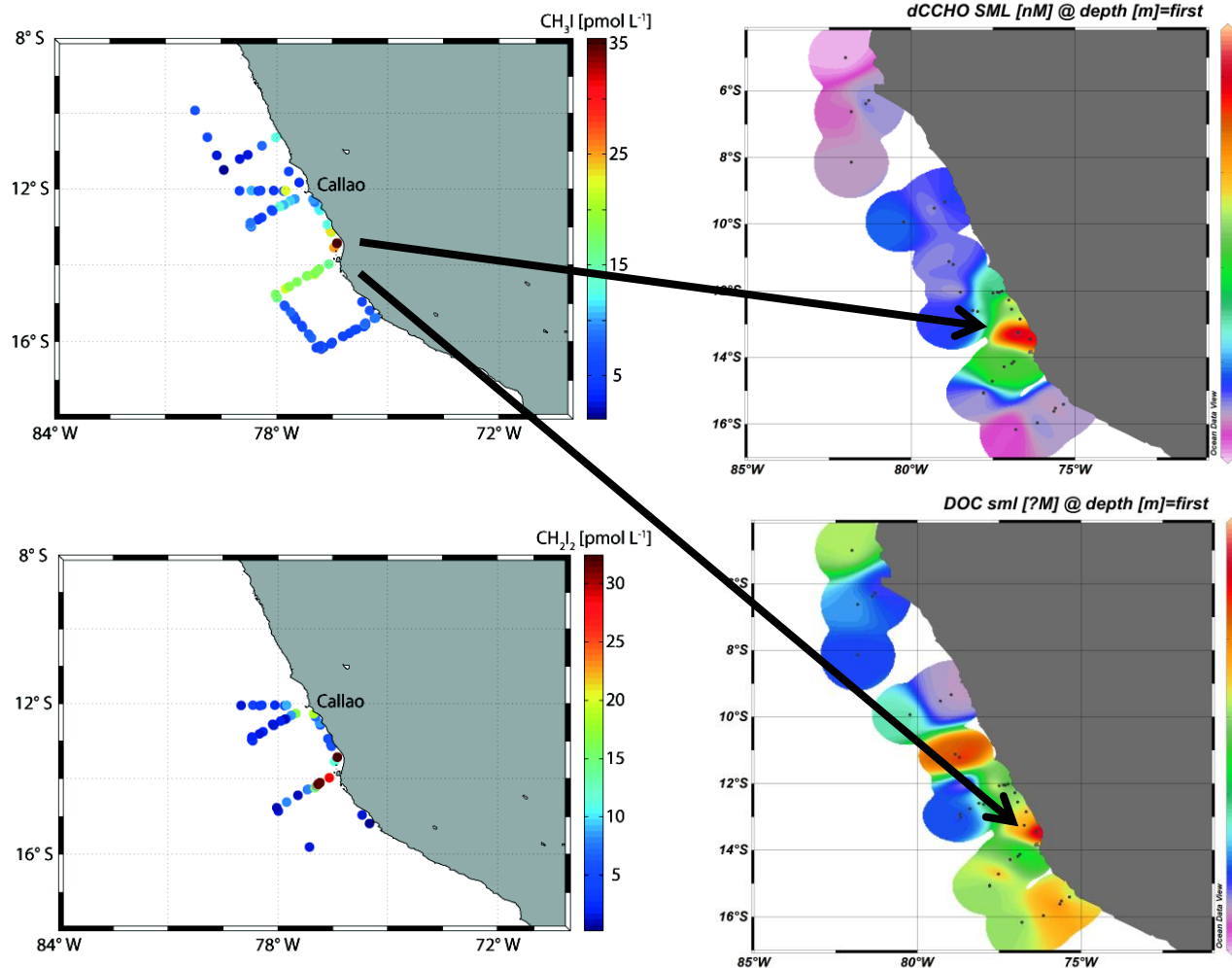


Iodocarbon sources – upwelling and phytoplankton



- Relationship with cooler water \rightarrow sources are in upwelling
- Iodocarbons correlate significantly with diatoms (dominant species in the surface) \rightarrow potential source organisms

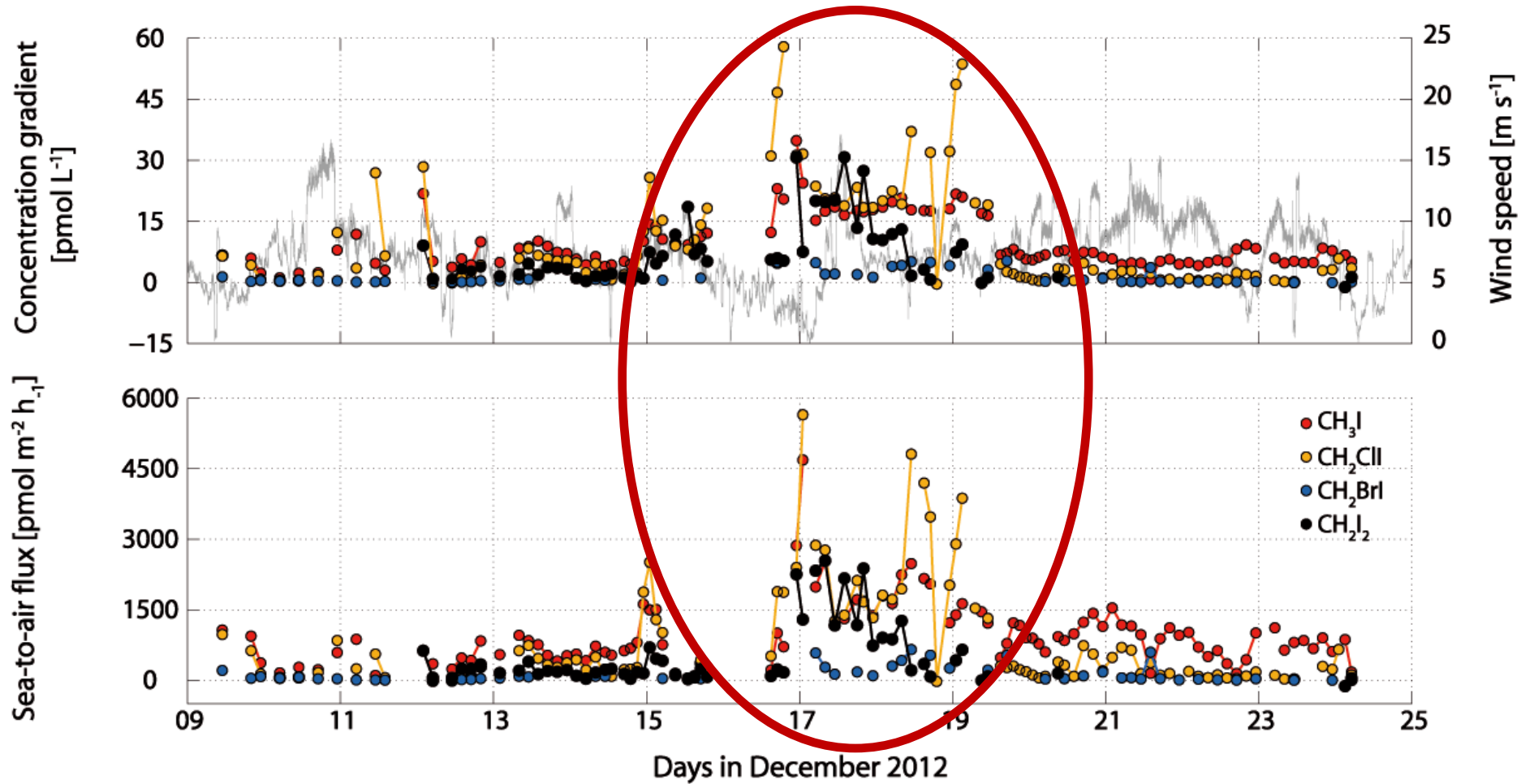
Iodocarbons and SML parameters



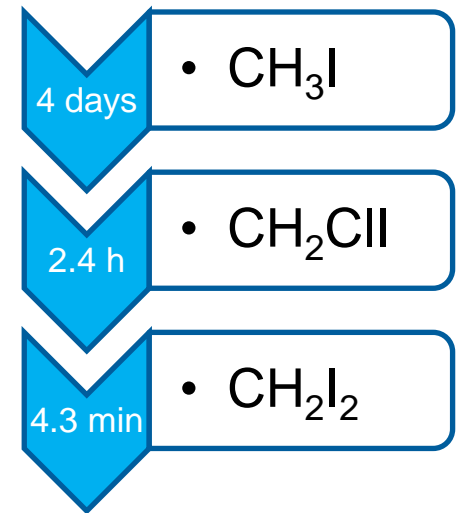
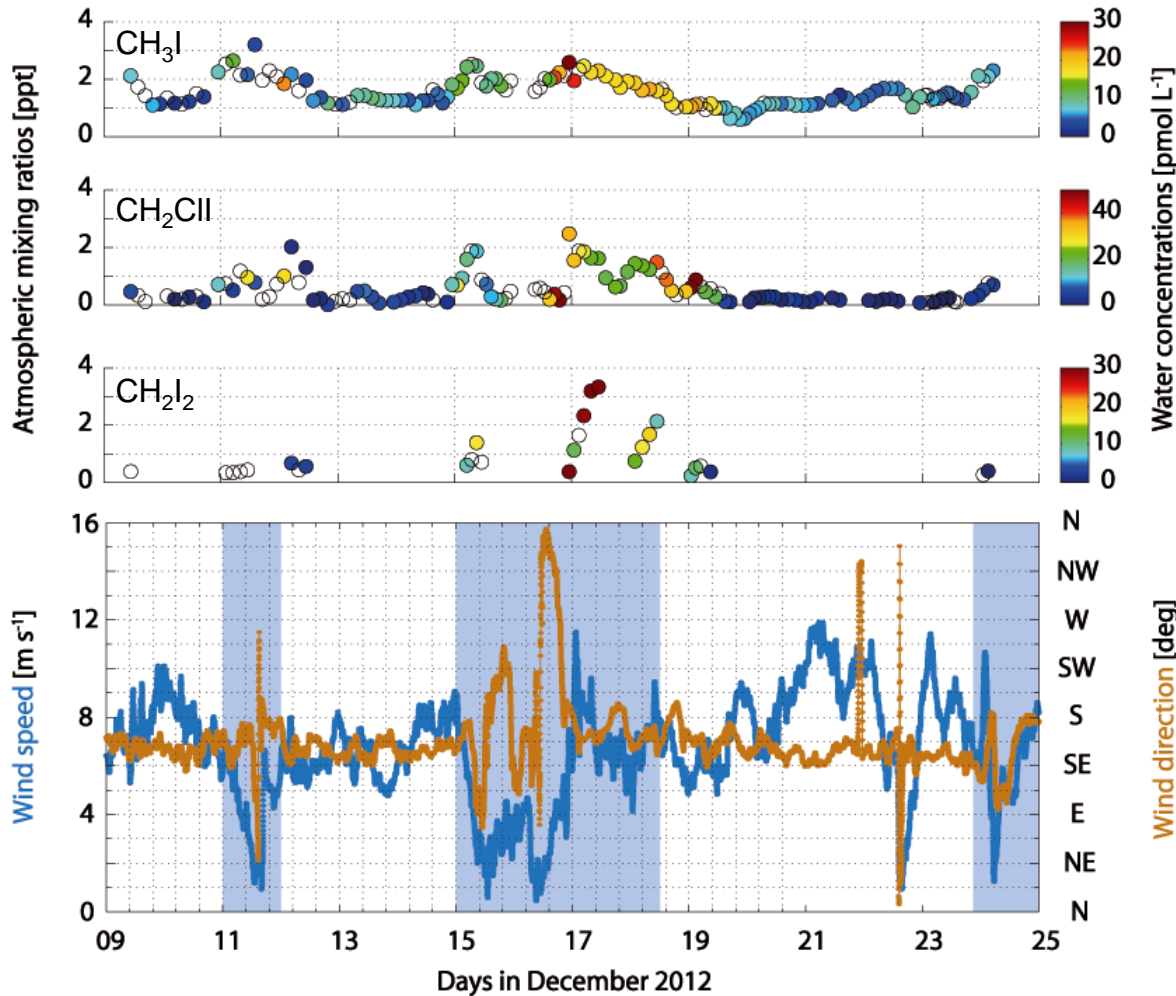
- Enhanced DOM concentrations such as sugars in the south where iodocarbons are elevated
- DOM constituents may be important halocarbon precursors → indirect biological production

SML Data from Engel et al.

Iodocarbon sea-to-air fluxes



Origin of atmospheric iodocarbons



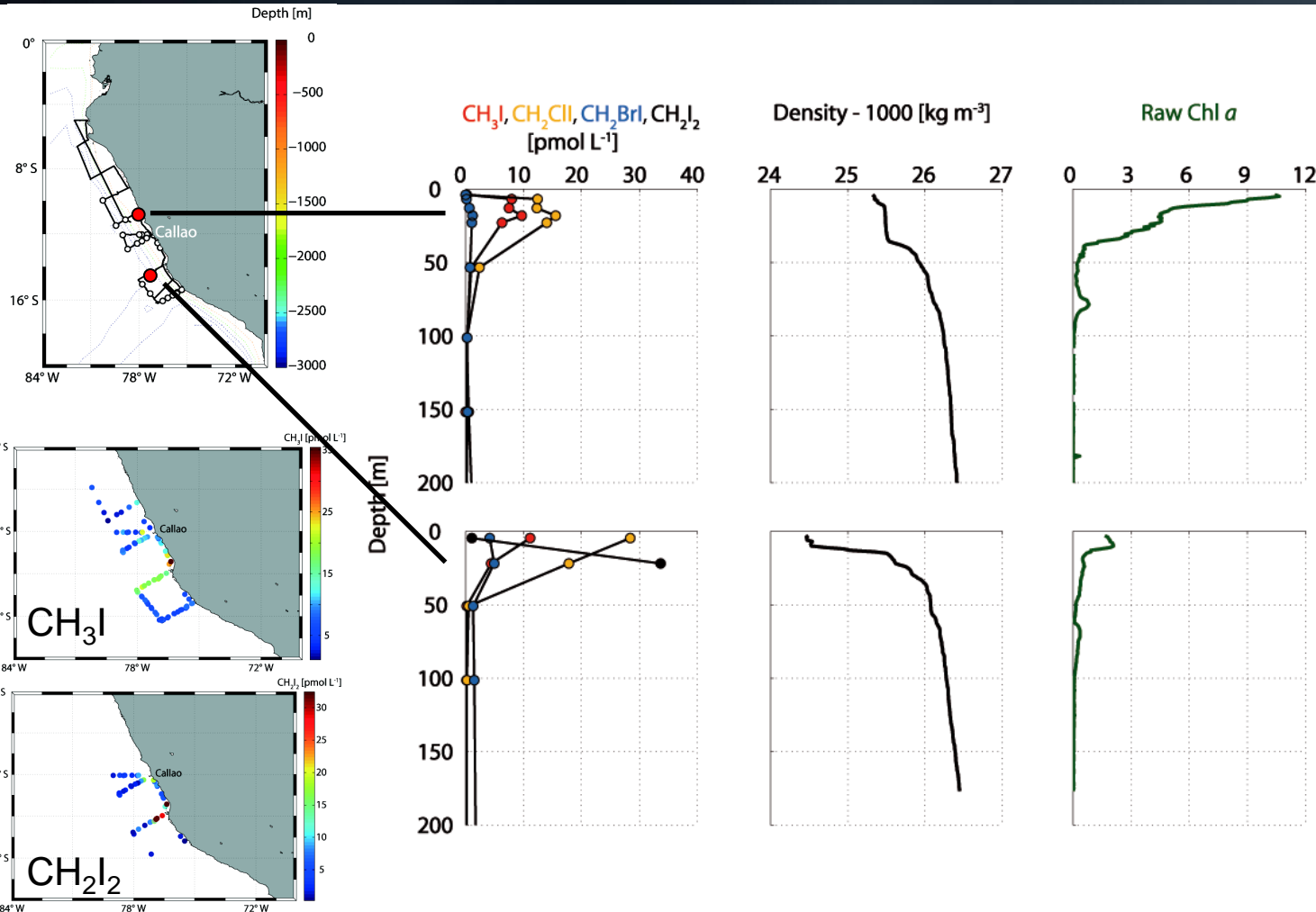
Tropical lifetime
(WMO, 2011)

- Peruvian upwelling is a source for halocarbons
- Only a moderate source for bromocarbons, but a strong source for iodocarbons
- Probably direct and indirect biological production as source for iodocarbons
- Very high iodocarbon sea-to-air fluxes despite low wind speeds



- Large oceanic concentrations contribute significantly to tropospheric iodine loading in the tropical East Pacific → high atmospheric mixing ratios of CH_3I , CH_2ClI and CH_2I_2 despite their very short tropical lifetimes

Iodocarbon depth profiles



- Two types of profiles: subsurface maxima and surface maxima (→ upwelling)
- Largest concentrations in profiles with surface maxima
- Surface usually depleted in CH_2I_2