

Measurements of molecular iodine in the open ocean marine boundary layer

Ru-Jin Huang

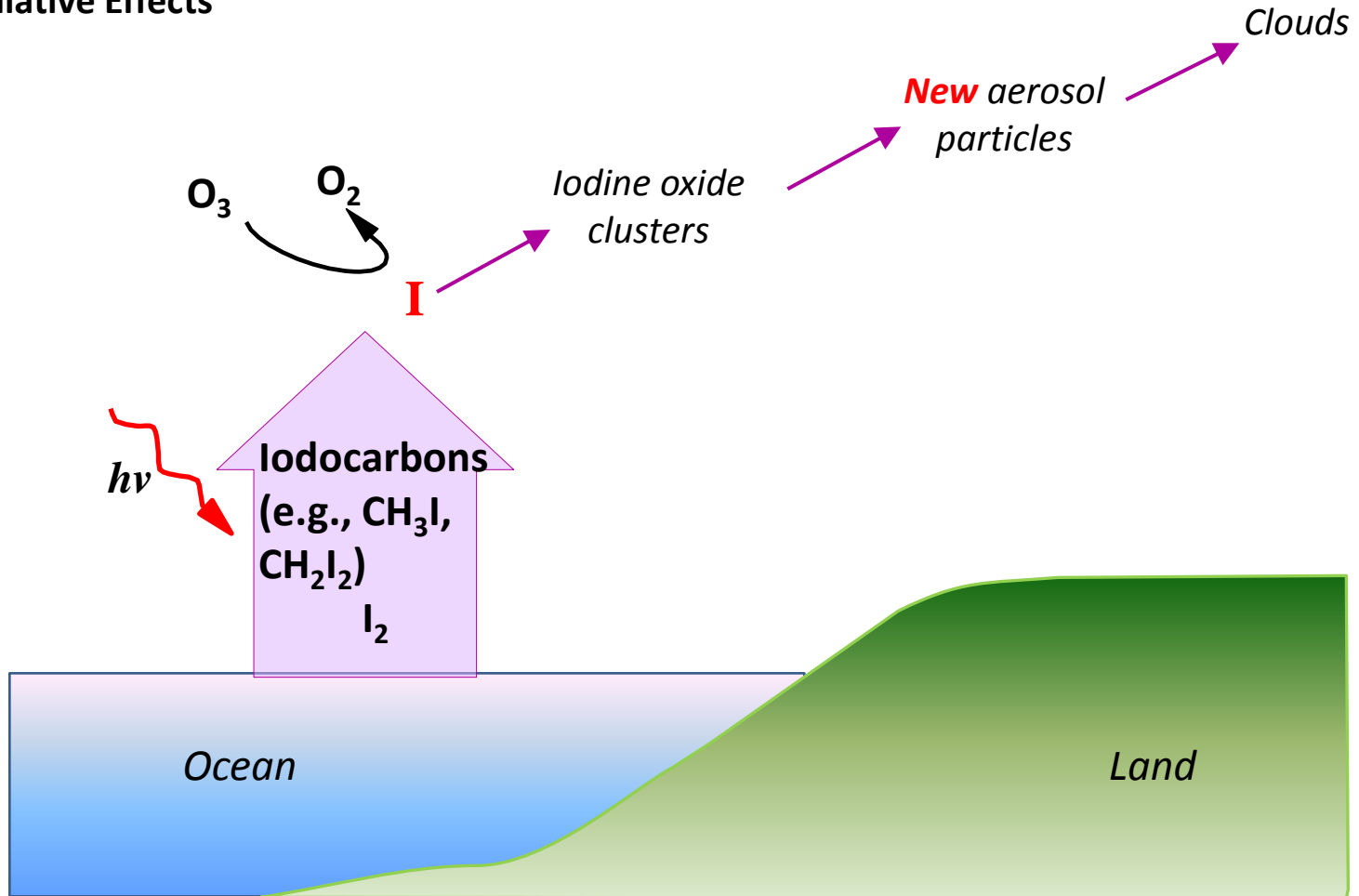
Thorsten Hoffmann

University of Mainz, Germany

Environmental importance of iodine

Ozone Destruction

Radiative Effects



Source of I₂ in the MBL (coastal)



Himanthalia elongata

Laminaria digitata

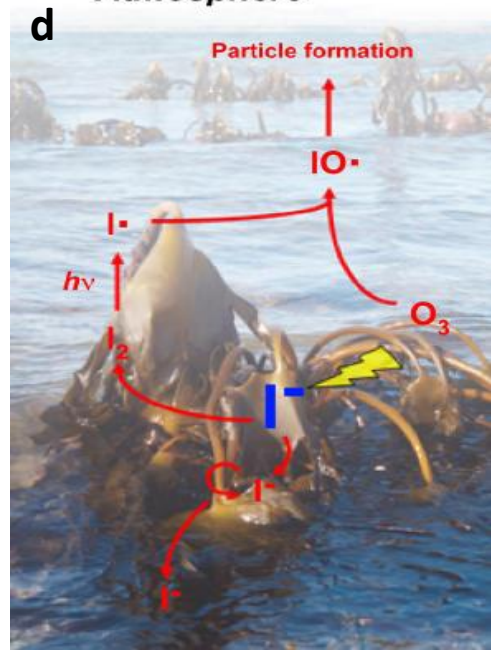
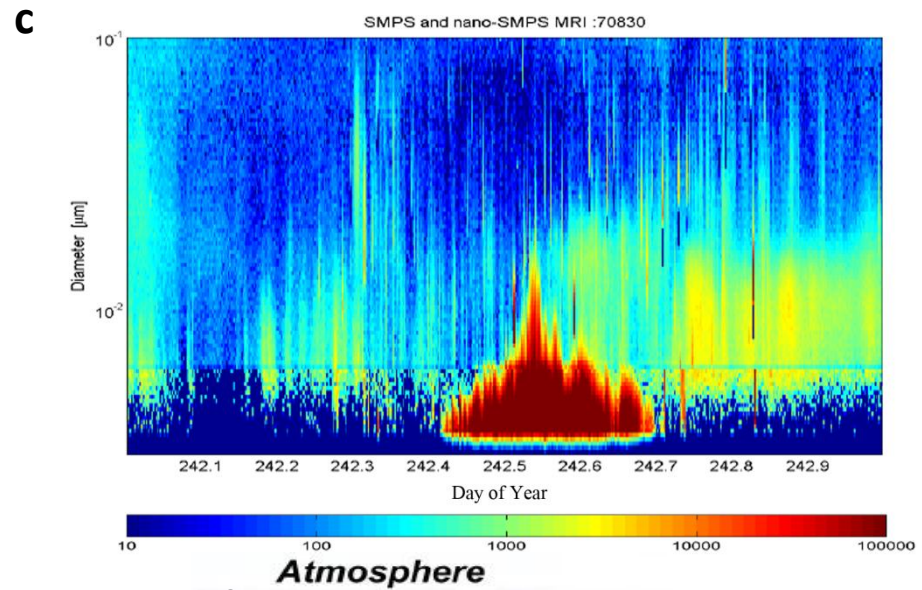
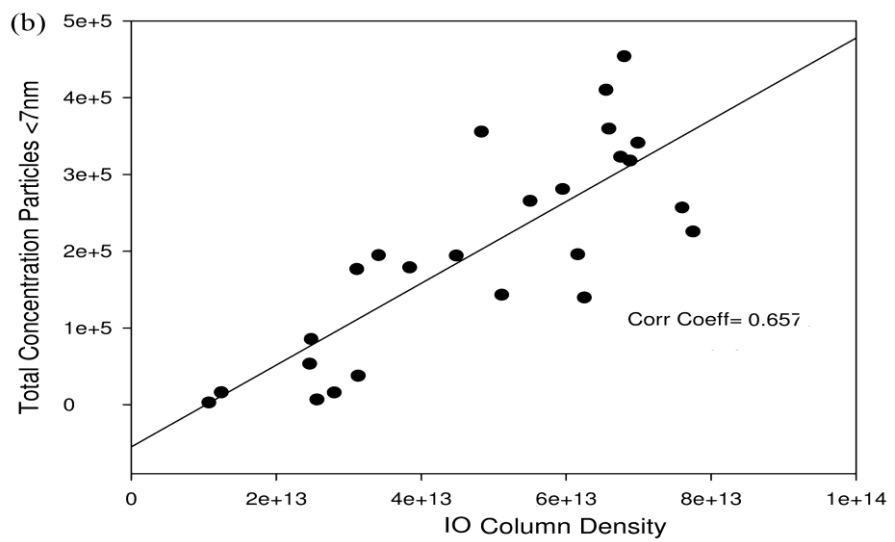
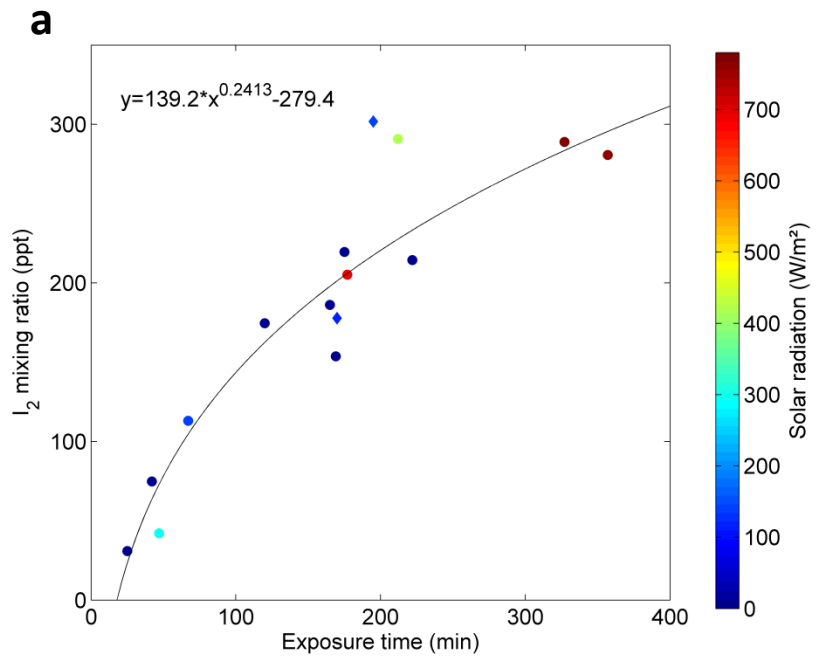
Palmaria palmata

Fucus vesiculosus

Ascophyllum nodosum



Iodine-oxide driven new particle formation at GAW Mace Head station



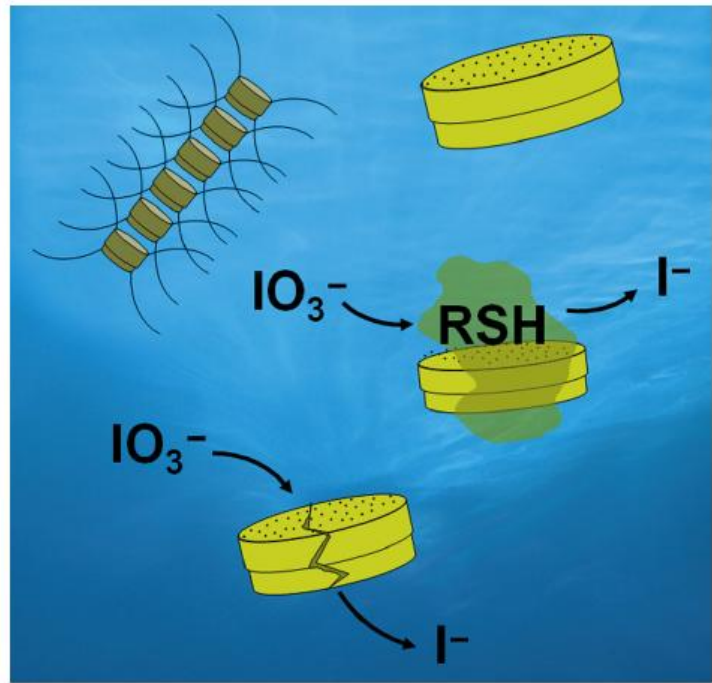
[Huang et al., *Geophys. Res. Lett.*, 2010; Huang et al., *ACPD* 2012]

Source of I₂ in the open ocean MBL

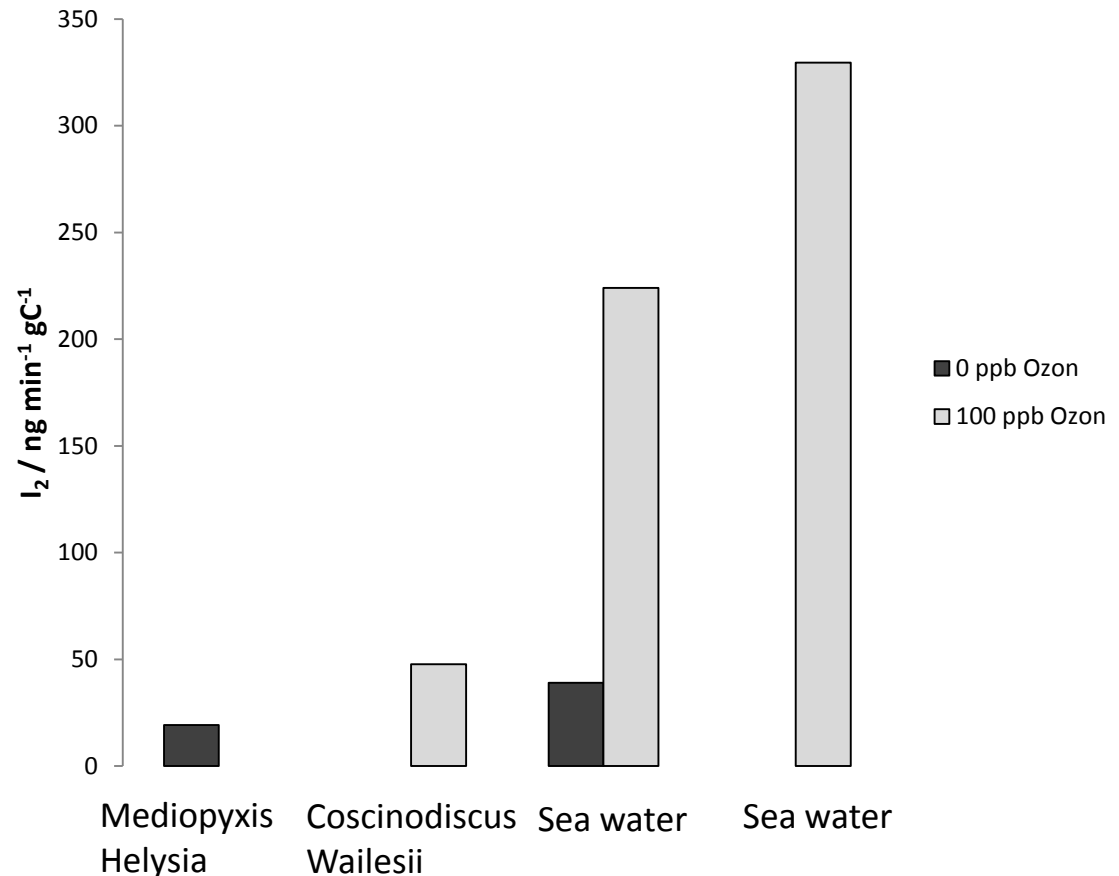
Biogenic

- Macroalgae (e.g., Pacific Ocean *Macrocystis pyrifera*, the giant kelp)
- Microalgae

[Bluhm et al., 2010]

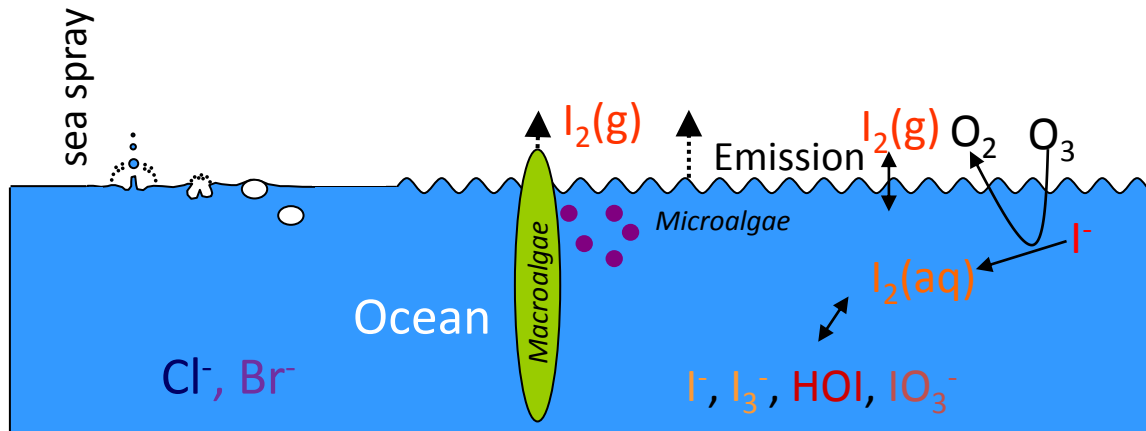
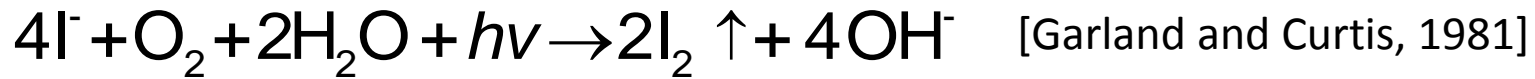
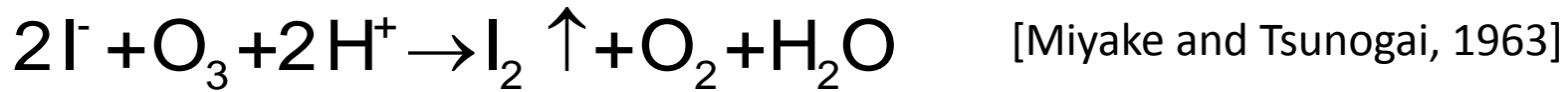


Intracellular material (RSH-thiols) leaking from phytoplankton cells converts iodate to iodide. RSH: organic sulphur species



Source of I₂ in the open ocean MBL

Abiotic

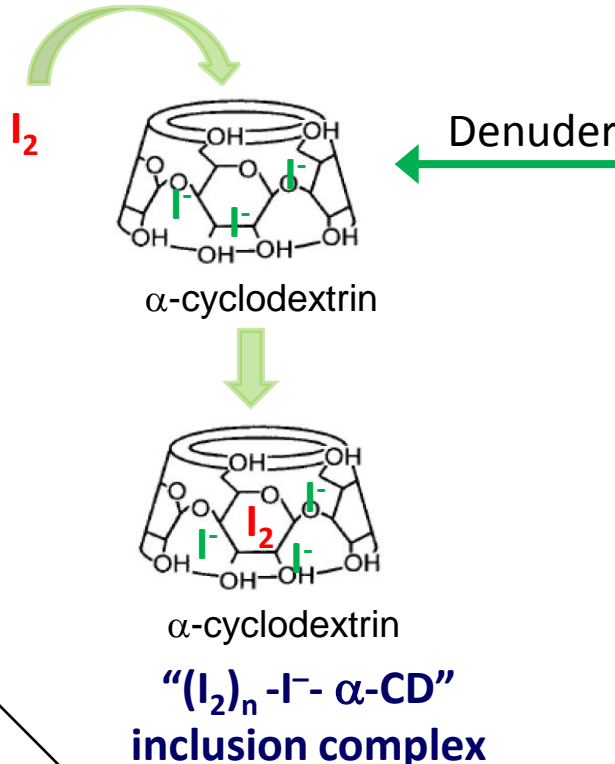
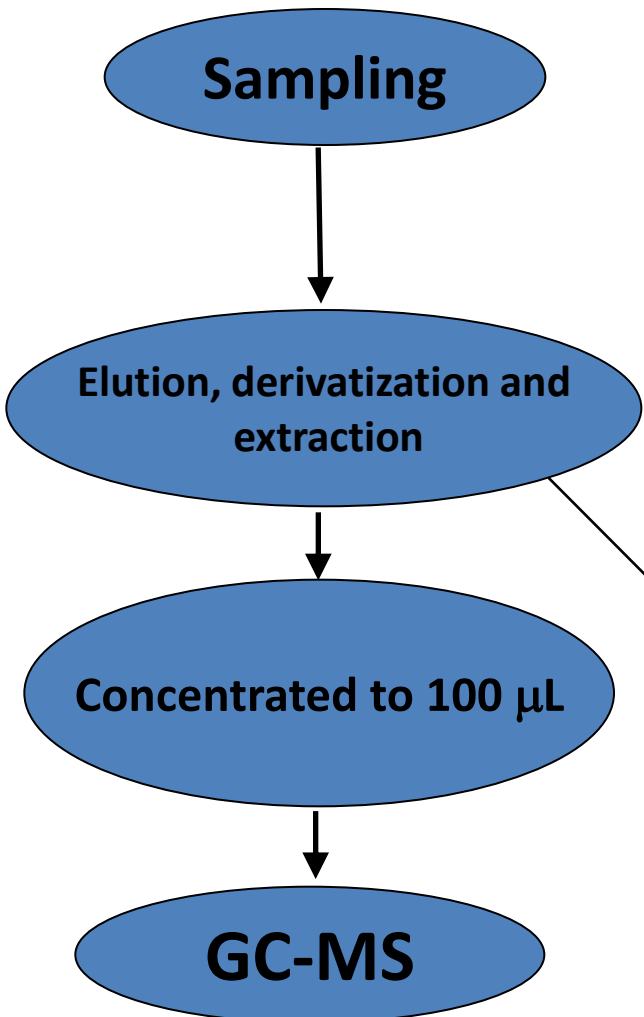


Why I₂ in open ocean MBL?

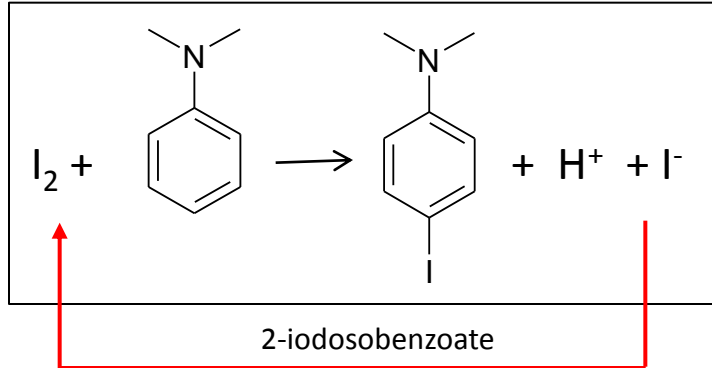
Iodocarbon fluxes—which are widely believed to be the major supply of iodine in the open ocean MBL—are capable of supporting only ~10–25% of the observed IO levels over the tropical Atlantic Ocean

Denuder/GC-MS for ambient I₂ measurement

LOD < 0.13 ppt (20 L air) α-cyclodextrin + nI₂ + I⁻ ↔ α-cyclodextrin · (I₂)_n · I⁻
 "point" measurement

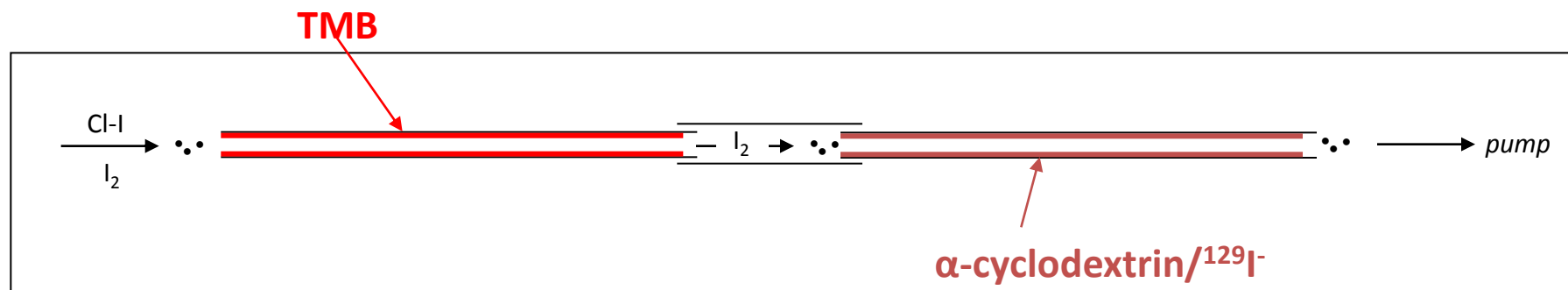
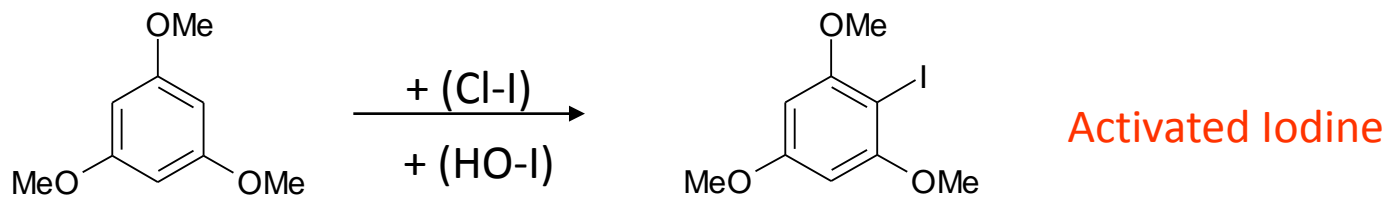


Sampling at Mweenish Bay, Ireland, 2007

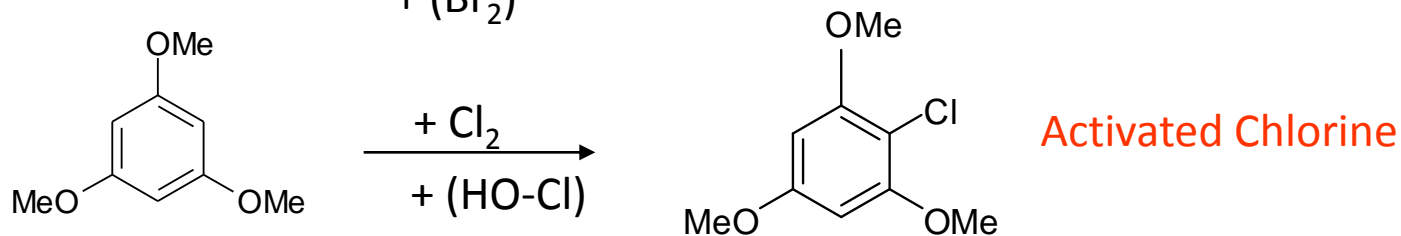
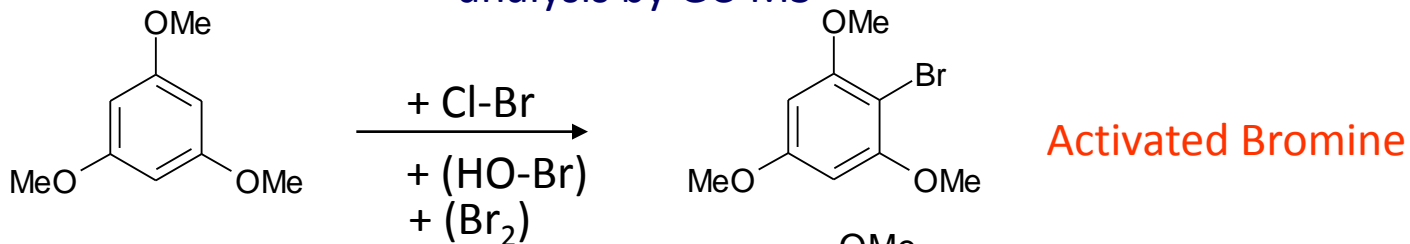


[Huang et al., *Environ. Sci. Technol.*, 2010]

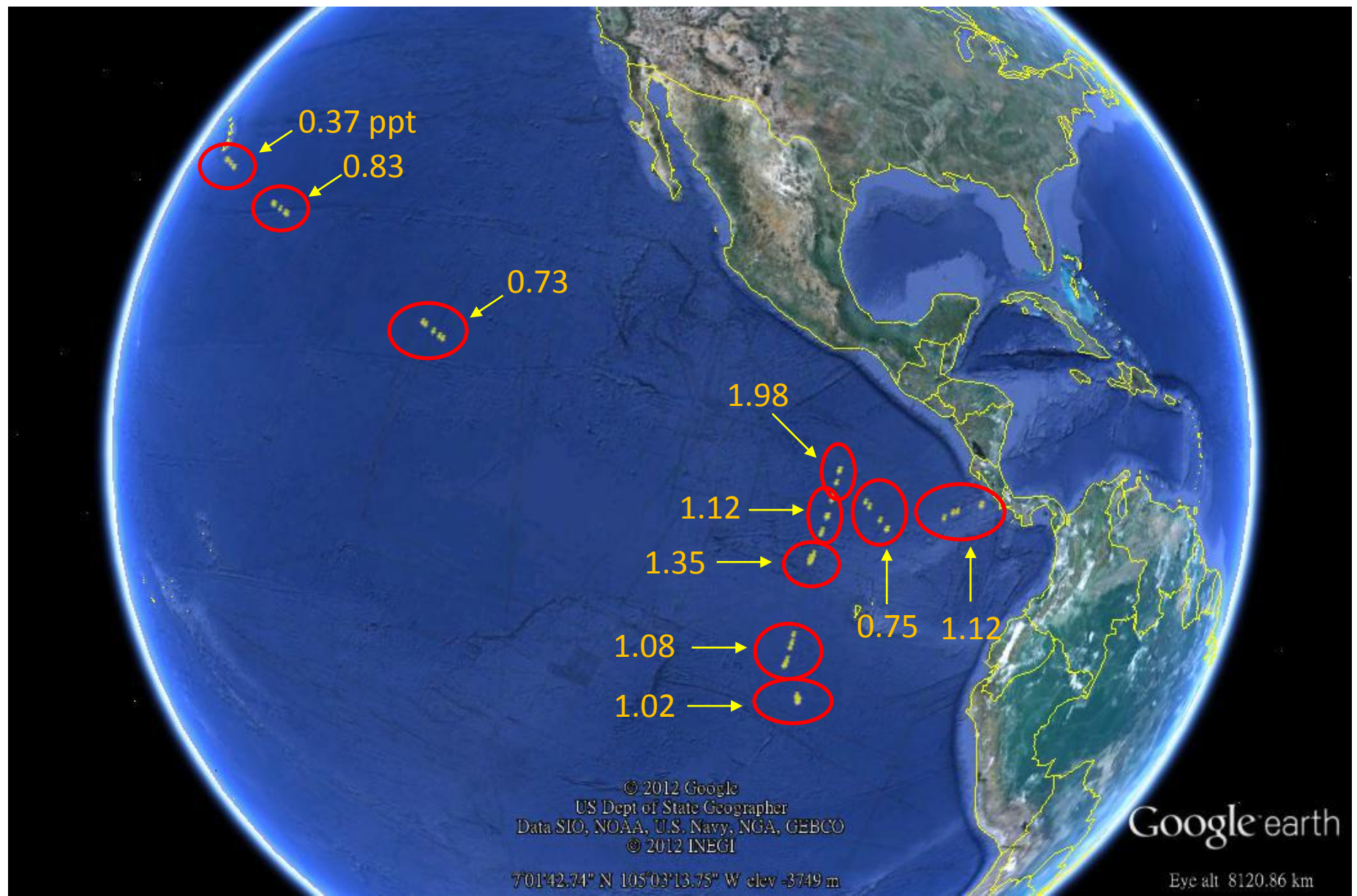
Novel approach for quantification of Activated Halogen Compounds



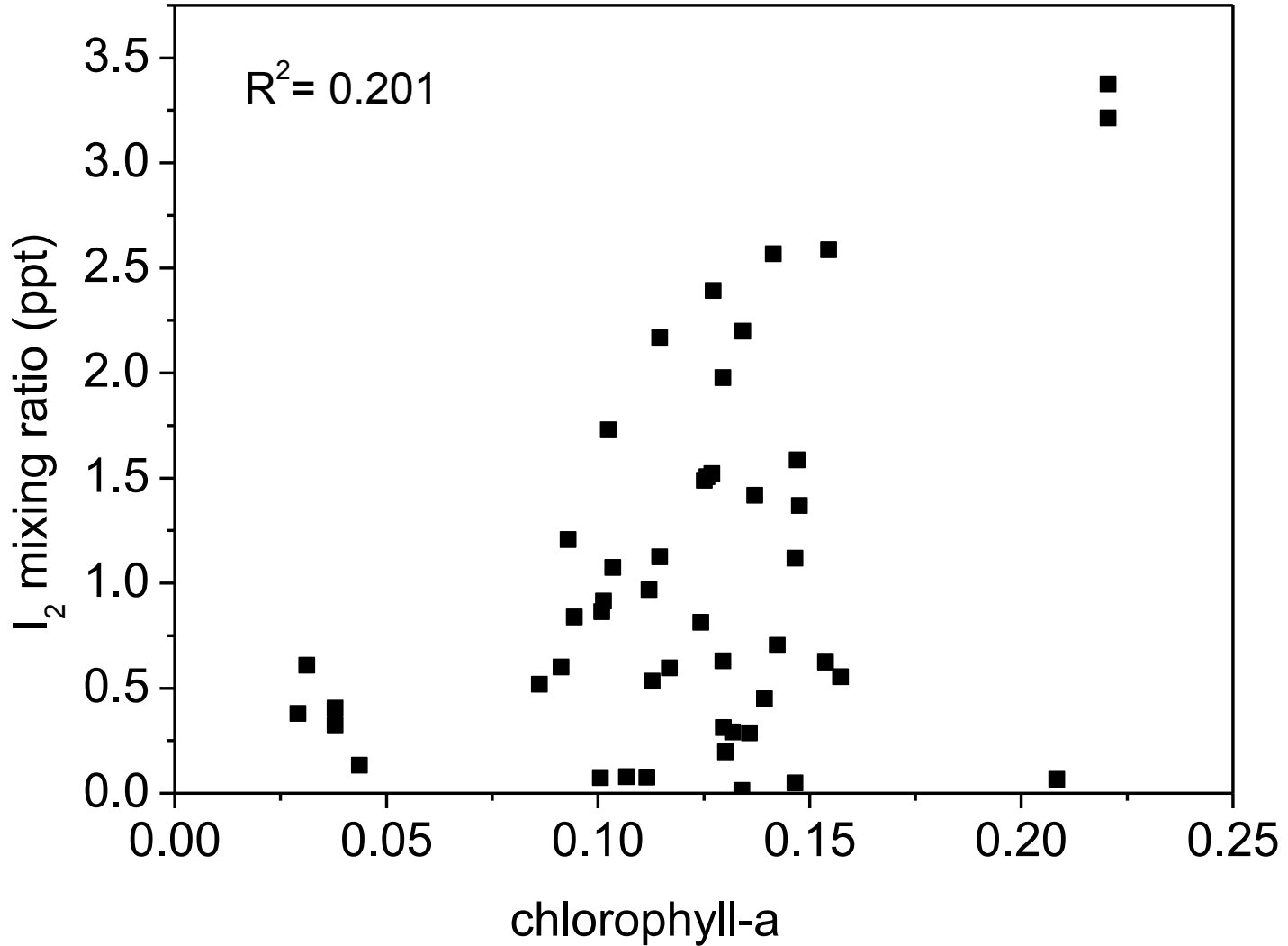
analysis by GC-MS



51 samples were collected during the cruise (27 Jan–29 Feb 2012)



I₂ mixing ratio v.s. chlorophyll-a (a general look)



More analysis needed!!

- Data of Chlorophyll-a from in situ measurements?
- Influence of solar radiation (data?)
- Wind direction, wind speed, back trajectory
- Surface O₃ concentration?
- Measurements of surface iodide (data?)

Thank you for your attention!