

# Vassilis Kitidis

## Biogeochemist

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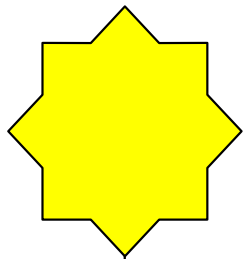
### Specific areas of interest

Dissolved Organic Matter cycling and photochemistry.

### Recent relevant publications

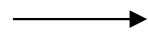
- Kitidis, V., et al., submitted. Photochemical Production and Consumption of Ammonium in a Temperate River-Sea System. *Marine Chemistry*.
- Kitidis, V. , 2008. Photochemical Mineralisation of Dissolved Organic Nitrogen. In: L.P. Mertens (Editor), *Biological Oceanography Research Trends*. Nova Science Publishers Inc., New York.
- Kitidis, V. et al., 2006. Variability of Chromophoric Organic Matter in surface waters of the Atlantic Ocean. *Deep Sea Research II*, 53: 1666-1684.
- Kitidis, V. et al., 2006. Photochemical production of ammonium in the oligotrophic Cyprus Gyre (Eastern Mediterranean). *Biogeosciences* 3: 439-449.
- Stubbins, A.P., et al., 2006, The Open Ocean Source of Atmospheric Carbon Monoxide. *Deep-Sea Research II*. 53, 1685-1694

# O<sub>2</sub> photo-oxidation - NH<sub>4</sub><sup>+</sup> photoproduction



$h\nu$

CDOM, NO<sub>3</sub><sup>-</sup>

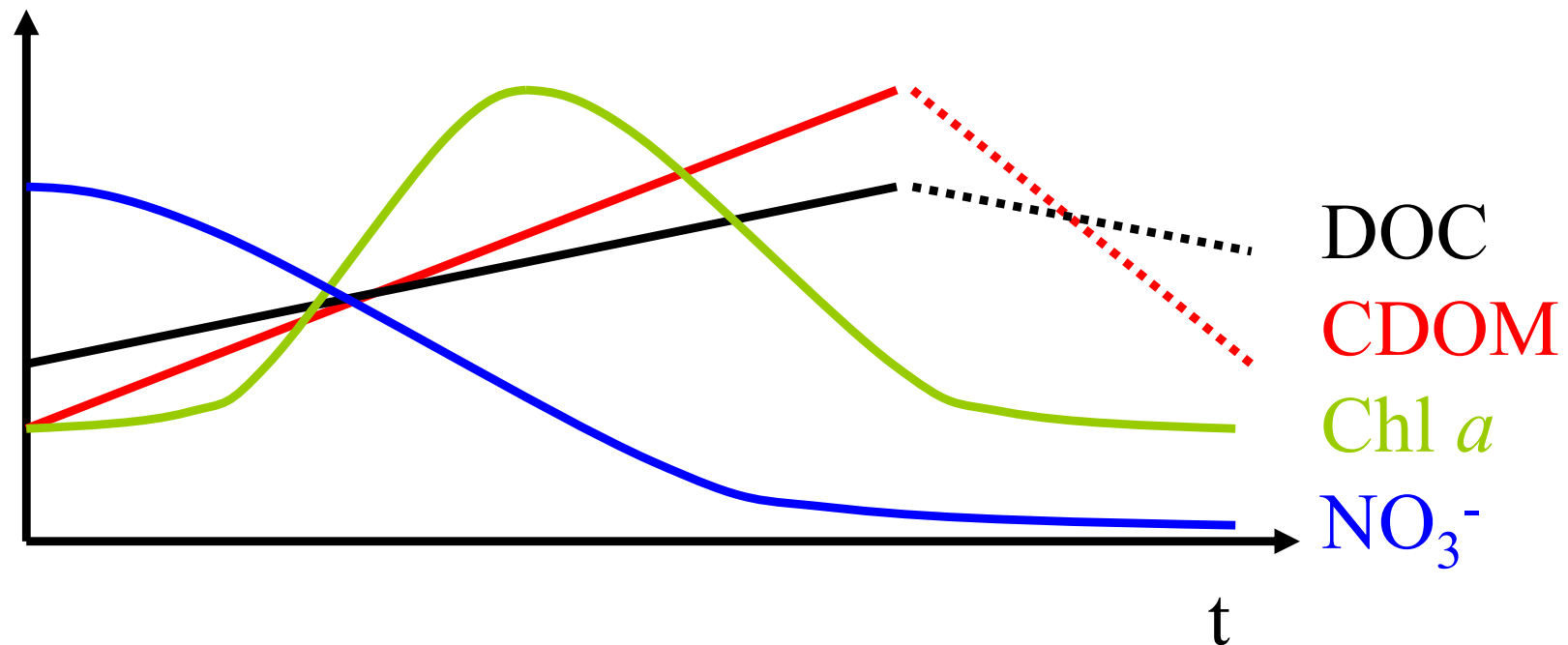


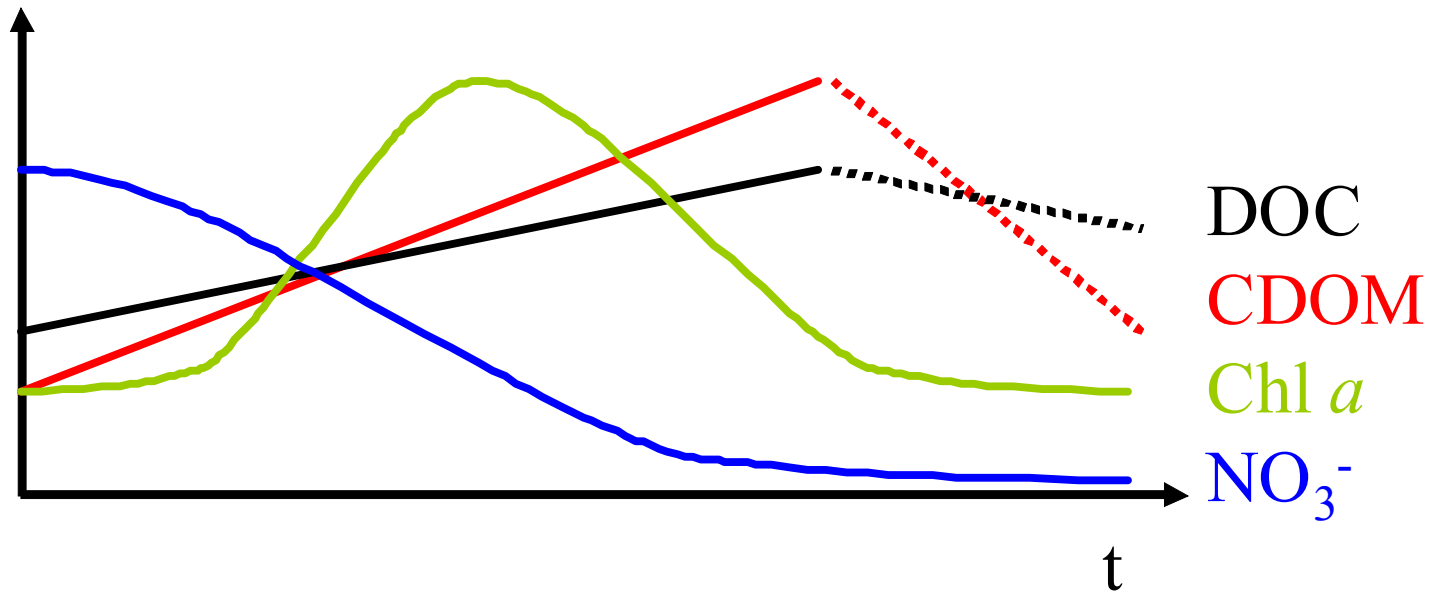
- O<sub>2</sub> consumption (Vas)
- NH<sub>4</sub><sup>+</sup> production (Vas/Malc W.)
- CDOM/DOC loss (Gavin/Erik)
- A.A. production (Erik)
- Change in DOM bioavailability (Mike)
- Bulk DOM chemical changes (Aron)

## Objective 2: Quantify photochemical fate of upwelled & new DOM

How does DOM age?

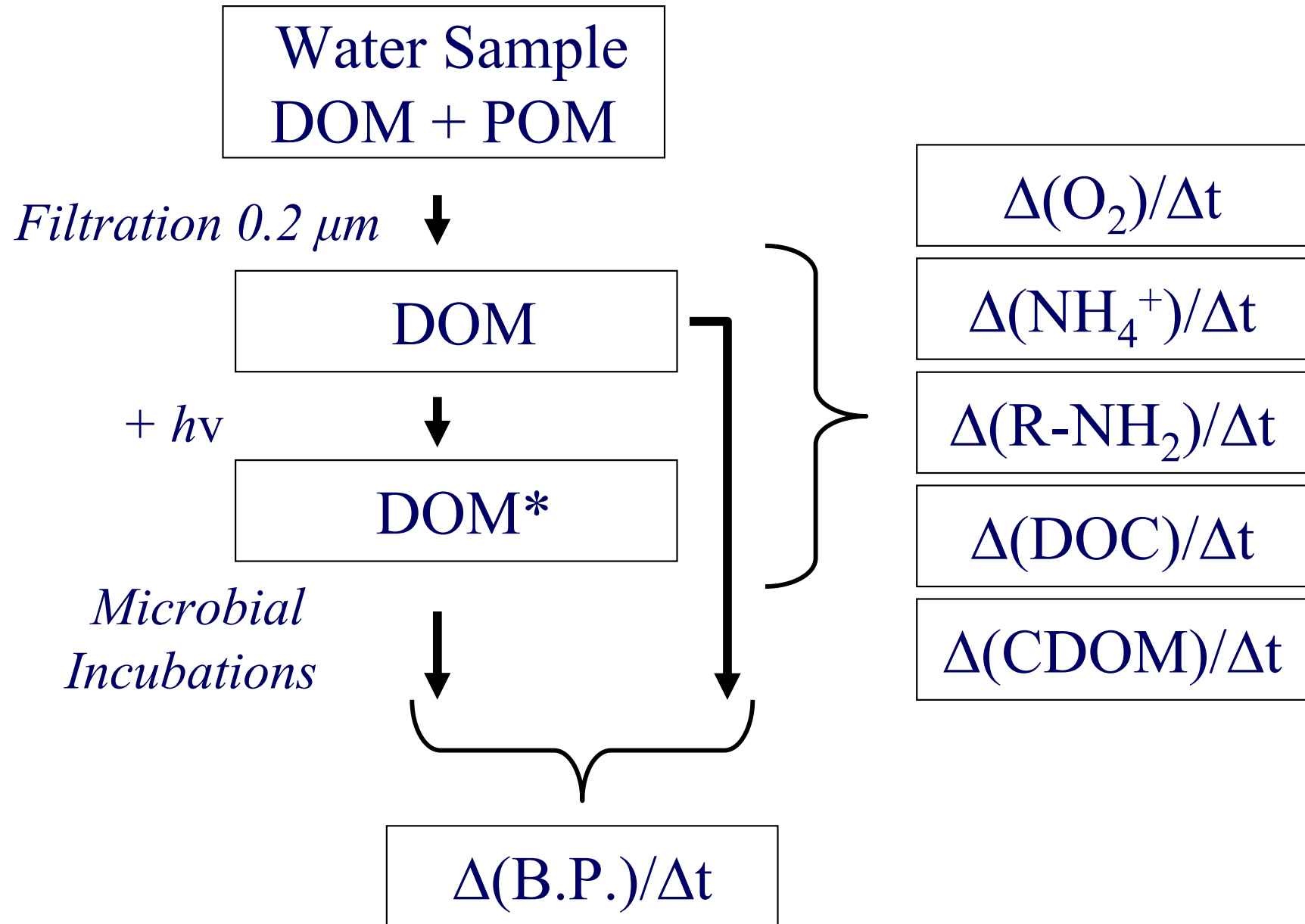
e.g. UV-chromophores in filament...



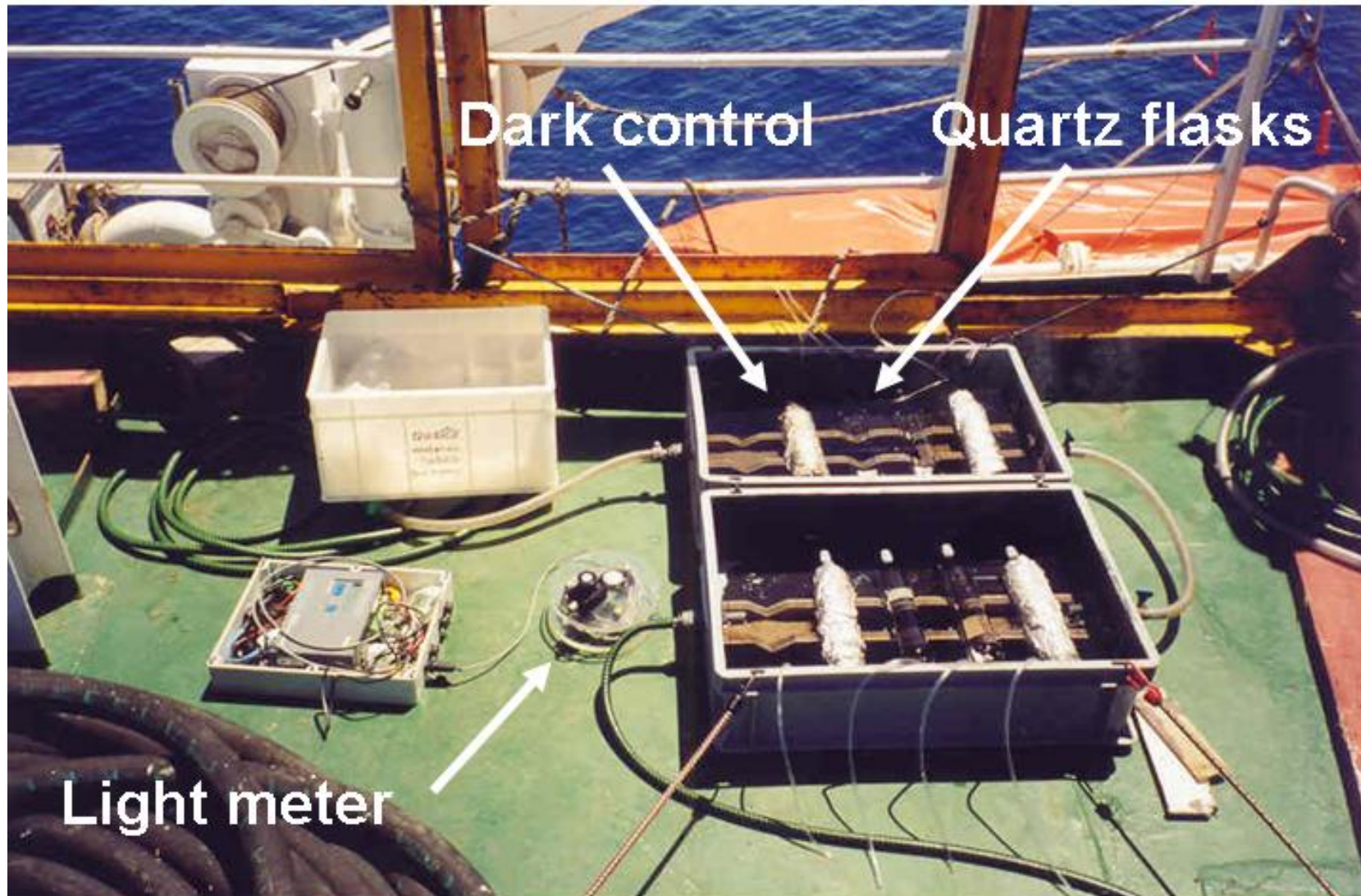


- Does absorbance per unit carbon change as the filament ages?
- How does that affect O<sub>2</sub> photoconsumption?
- ... NH<sub>4</sub><sup>+</sup> photoproduction?
- Is NO<sub>3</sub><sup>-</sup> a significant chromophore?

# Experimental setup



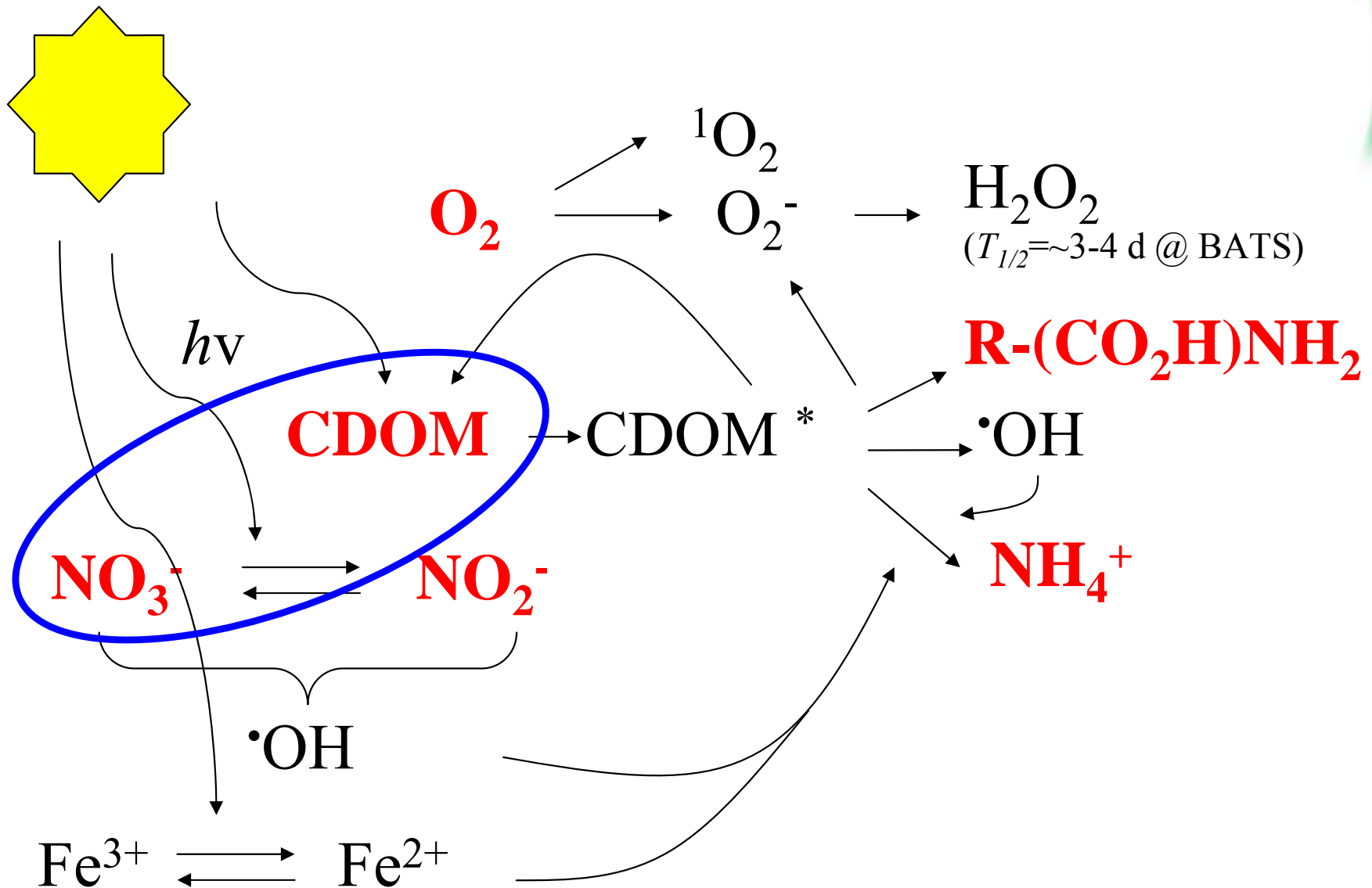
# Experimental setup



## Sampling/water/space required

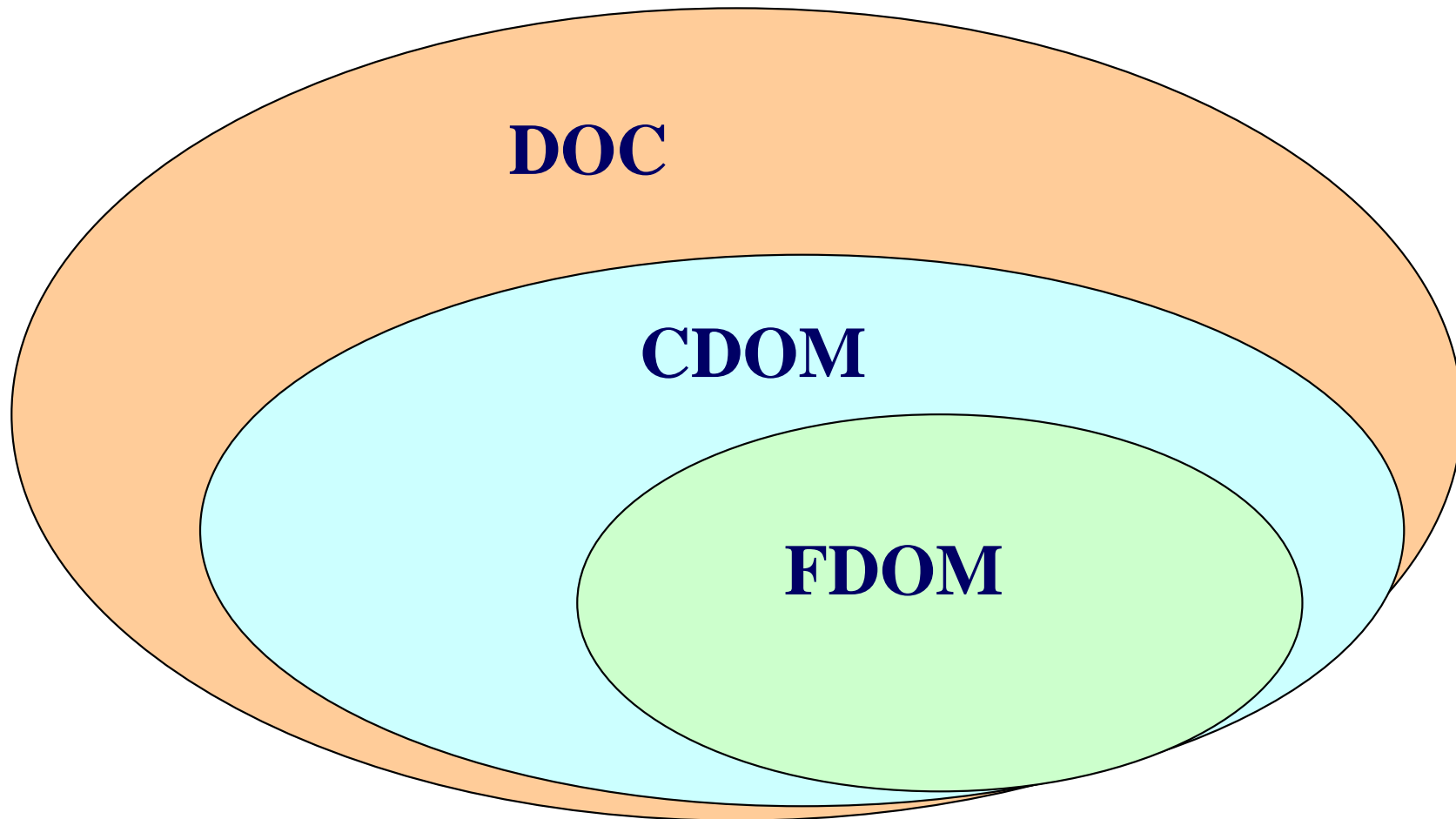
- Filters (0.2  $\mu\text{m}$ ) / Quartz flasks
- Several litres
- Light field (natural vs. artificial)?
- Space on deck if natural light (lots of light)
- Light filters (% PAR vs. longpass cutoff)?
- pH measurements?

# Photochemical Reactions



# DOM

photoreactivity / origin / freshness



## DOC – Amino Acids (Eric Achterberg)

- All-glass filtered (0.2  $\mu\text{m}$ ) water for DOC (40 mL)
- Glass ampoules for DOC are flame sealed
- DOC by HTCO, depth profiles + irradiations
- AA filtered (0.2  $\mu\text{m}$ ; 40 mL) and frozen (-80 °C)
- AA determined by HPLC

## DOC – Characterisation (Aron Stubbins)

- Large volume filtered (30 L: upwelled + oligotrophic)
- DOM concentrated by Electro-Dialysis RO
- ESI-ICR-FT-MS

Electro Spray Ionization Ion Cyclotron Resonance Fourier Transform Mass Spec.

Sub 1-unit  $m/z$  resolution (15 T magnetic field compared to 0.2 T GCMS),  
i.e. You can tell the difference between  $\text{CH}_4$  and O ( $m/z$  16 u,  $\Delta m/z \sim 0.036$  u)

Mopper, K., **Stubbins, A.**, Ritchie, J.D., Bialk, H.M., Hatcher, P.G., 2007. Advanced instrumental approaches for characterization of marine dissolved organic matter: Extraction techniques, mass spectrometry, and nuclear magnetic resonance spectroscopy. *Chemical Reviews* 107, 419-442.

## DOC/AA turnover & bioavailability (Mike Zubkov)

- Does irradiation alter DOM bioavailability?
- Bio-assays to determine the effect of irradiation on bacterial productivity and nutrient content.
- ~2 L of water required (pre- + post-irradiation)

## Water requirements

- O<sub>2</sub> : 250 mL
  - NH<sub>4</sub><sup>+</sup> : 150 mL
  - DOC : 50 mL
  - AA : 50 mL
  - CDOM 150 mL
- } 400 mL

Gavin has 1 L quartz bottles, i.e. 0.6 L spare for Mike Irradiations in triplicate. Therefore 1.8 L for Mike