

Optical properties of marine DOM in the NW Iberian coastal upwelling system

X.A. Álvarez-Salgado¹, C. Romera-Castillo², C. Lønborg¹,
M. Nieto-Cid¹, C. Marrasé²



¹ CSIC, Instituto de Investigaciones Marinas, Vigo, Spain

² CSIC, Instituto de Ciencias del Mar, Barcelona, Spain

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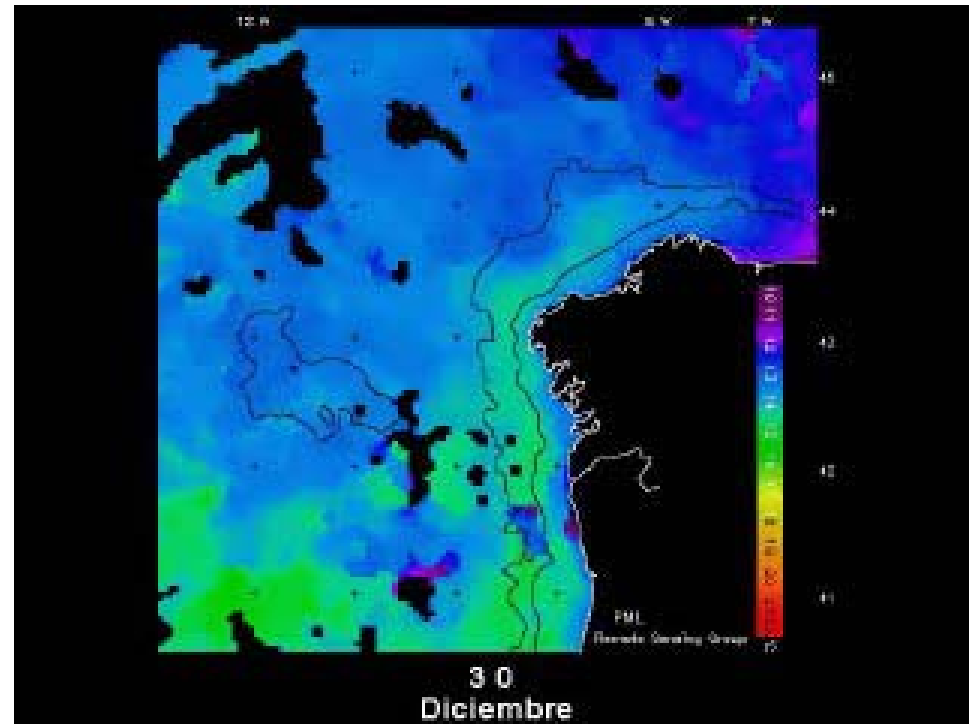
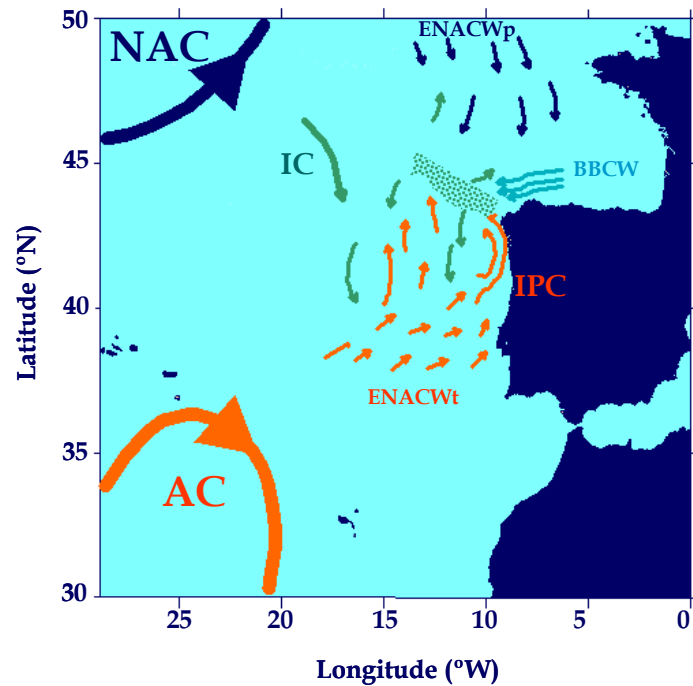
CDOM in the NW Iberian upwelling system

outline of this talk

- ▶ study site: the NW Iberian upwelling system in brief
- ▶ CDOM in rain water of the Ría de Vigo
- ▶ CDOM in marine waters of the Ría de Vigo
- ▶ *in vitro* net community production (NCP) of fluorescent CDOM
 - ▶ daily incubations
 - ▶ monthly incubations

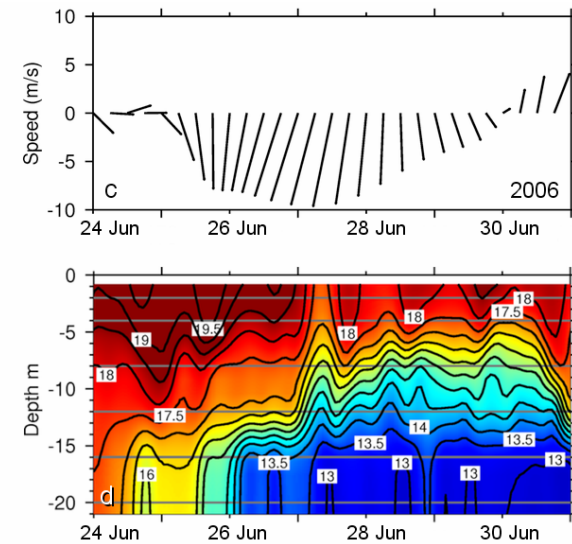
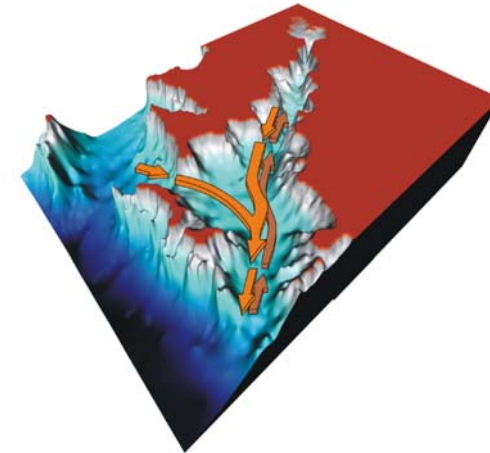
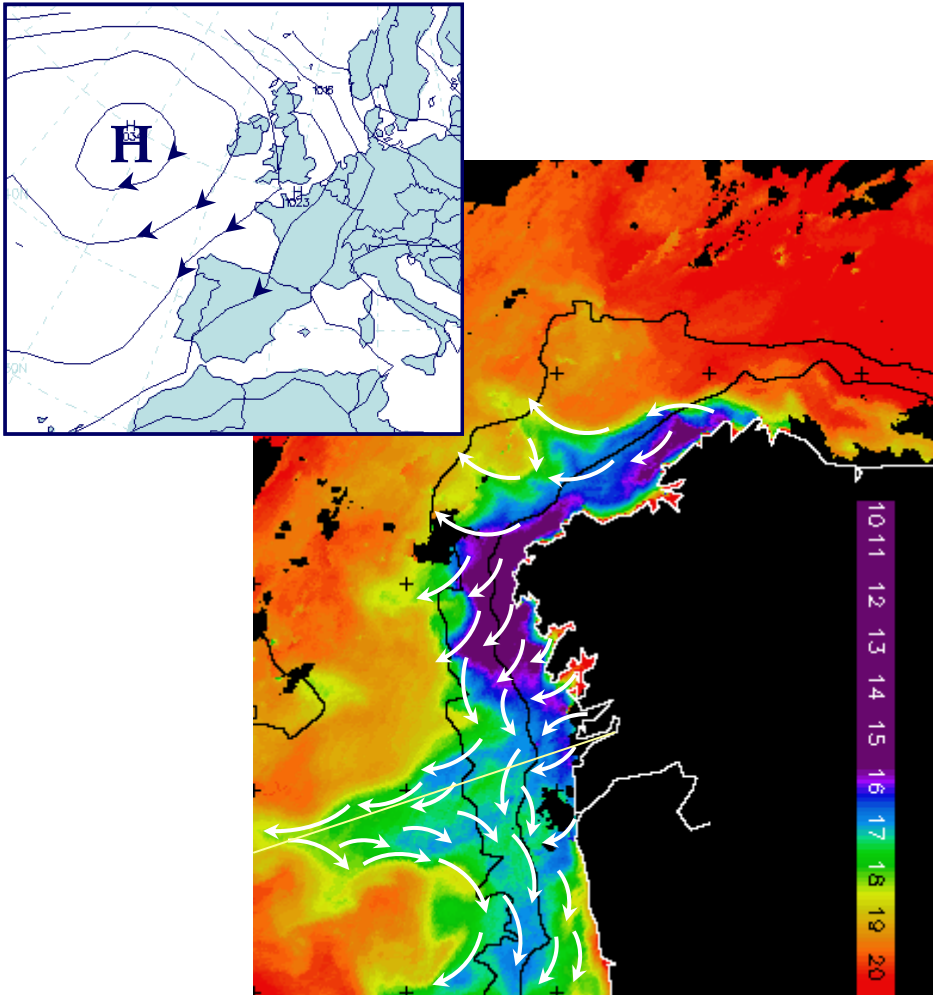
the NW Iberian upwelling system in brief

the rías, large coastal embayments driven by remote winds



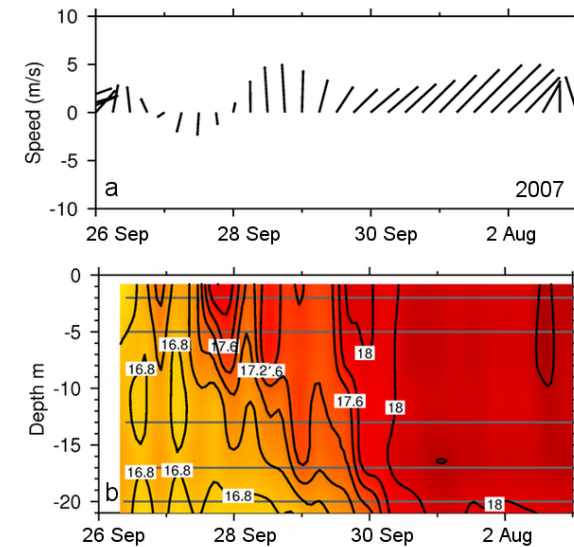
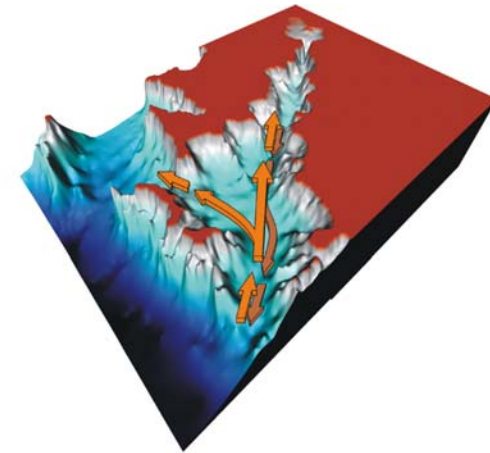
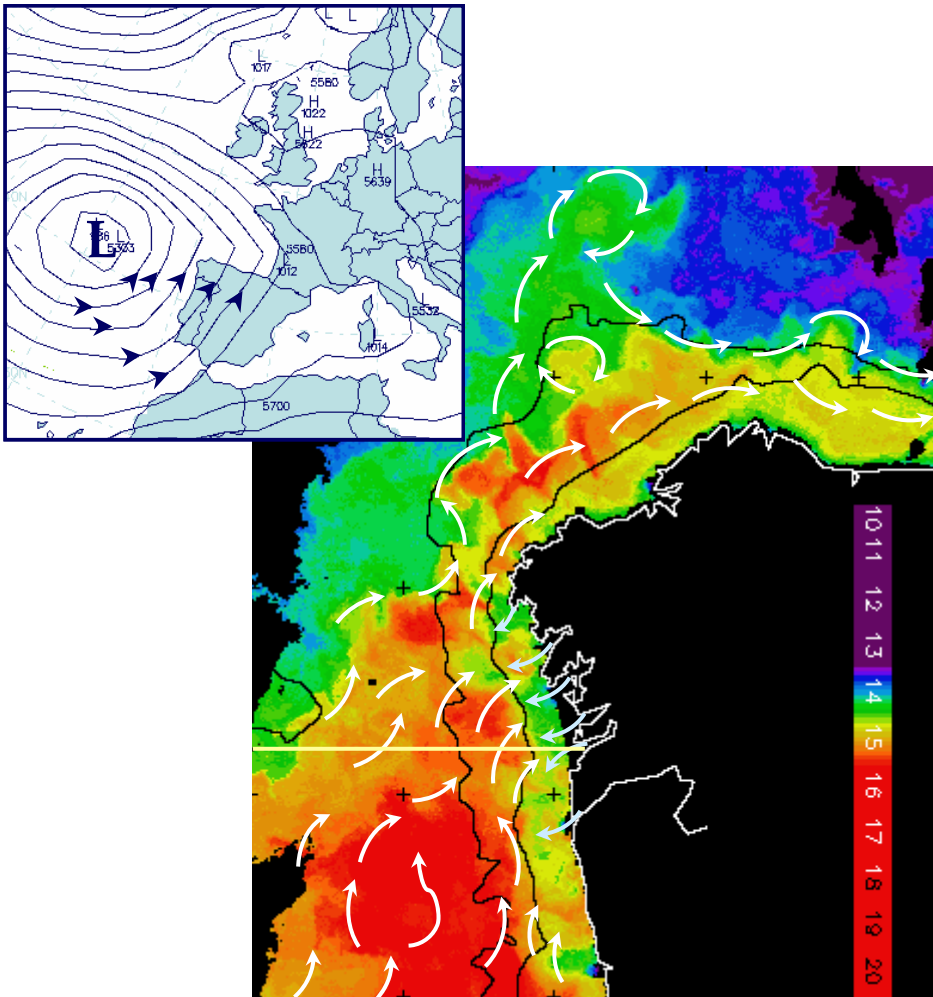
the NW Iberian upwelling system in brief

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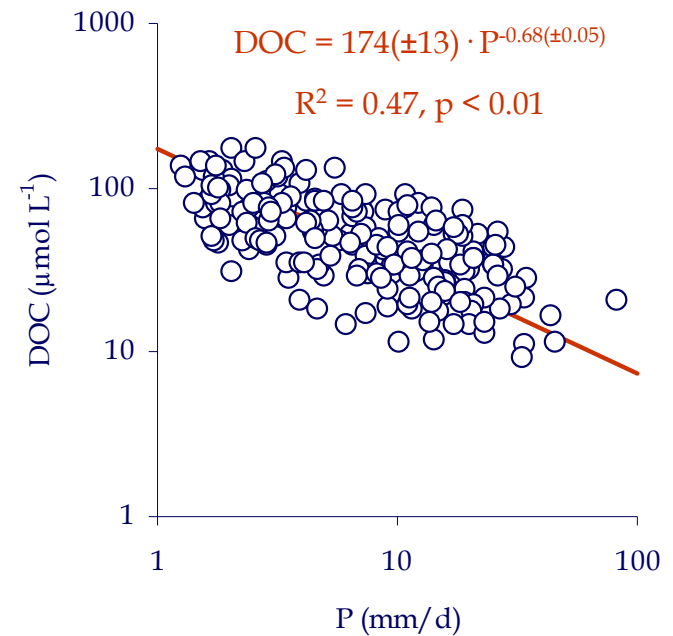
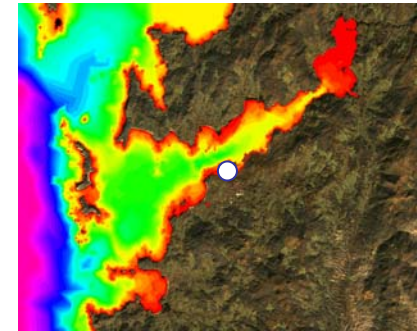
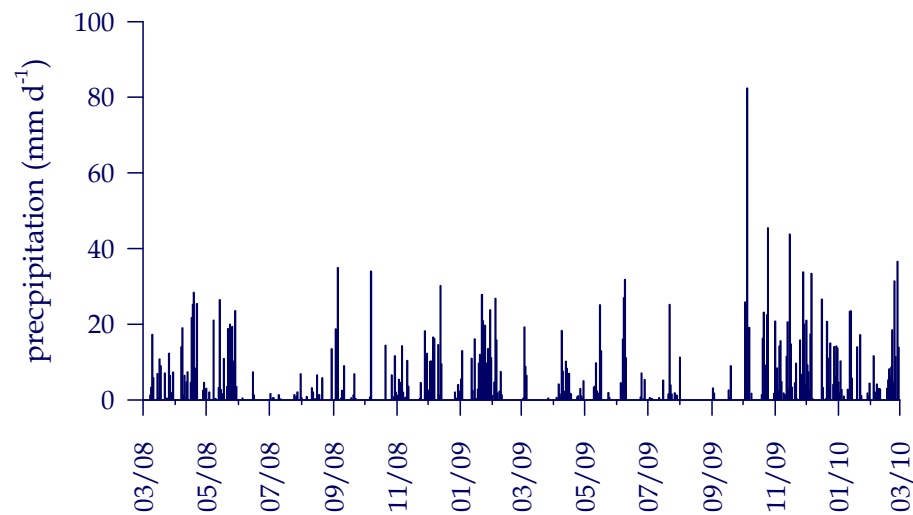


the NW Iberian upwelling system in brief

the rías, large coastal embayments driven by remote winds

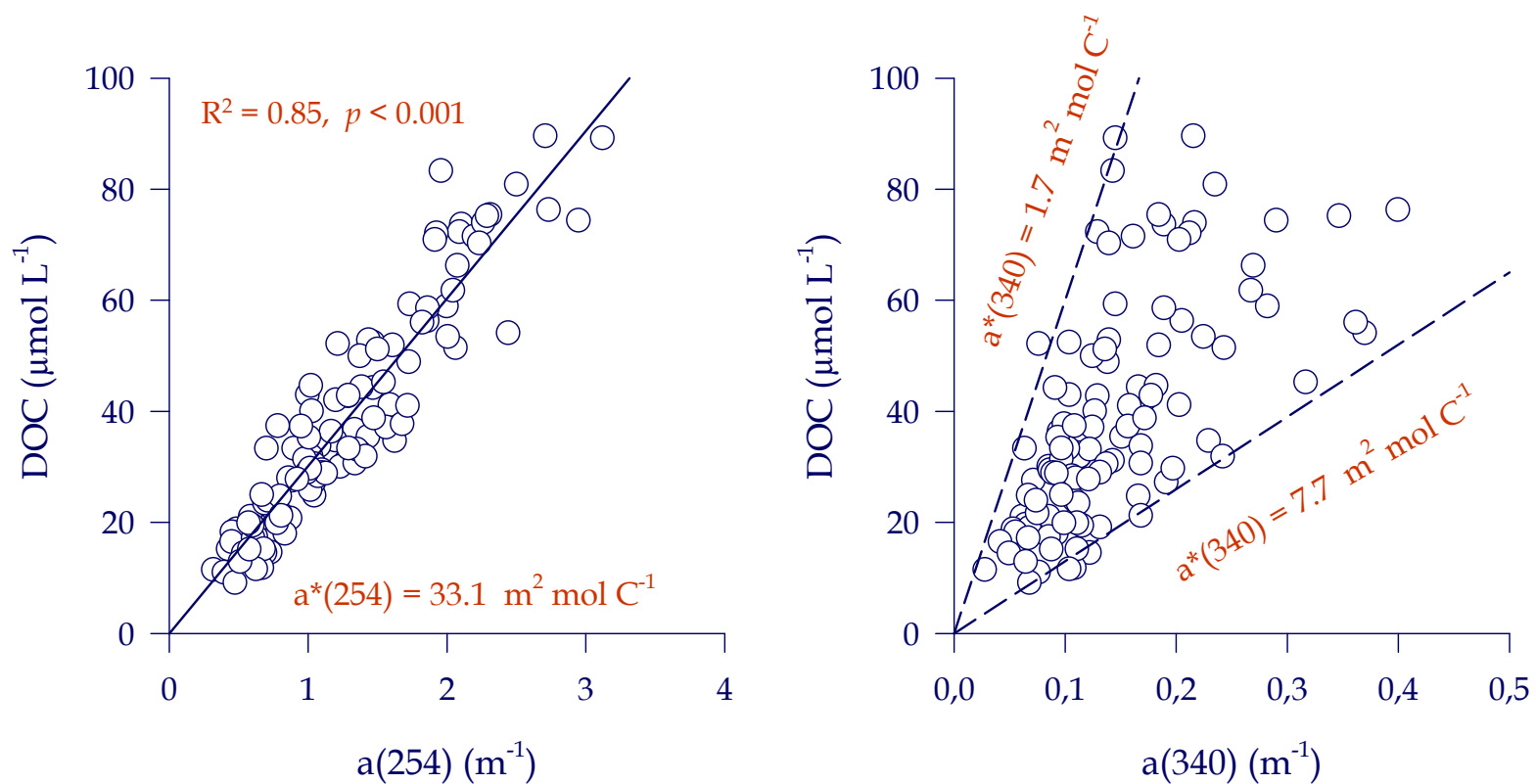


CDOM in rain water to the Ría de Vigo absorbance, induced fluorescence and quantum yield of CDOM

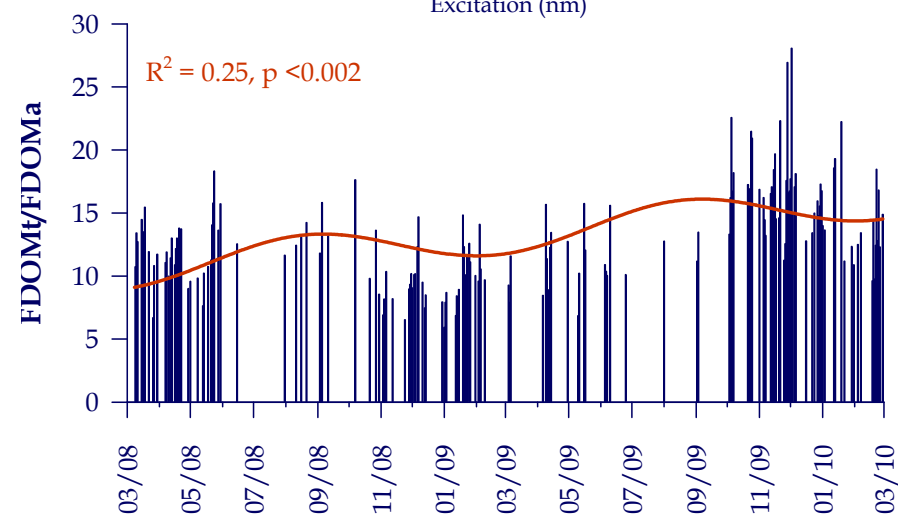
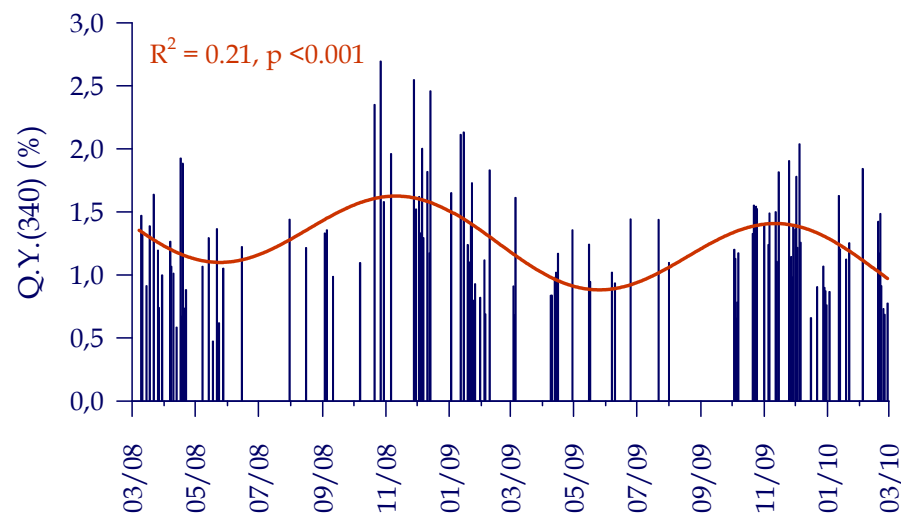
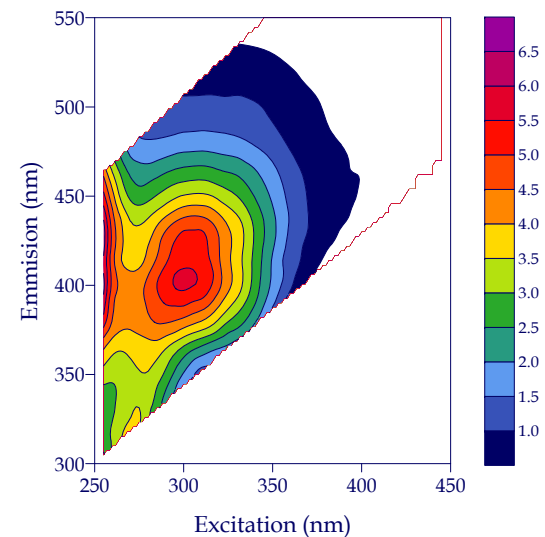
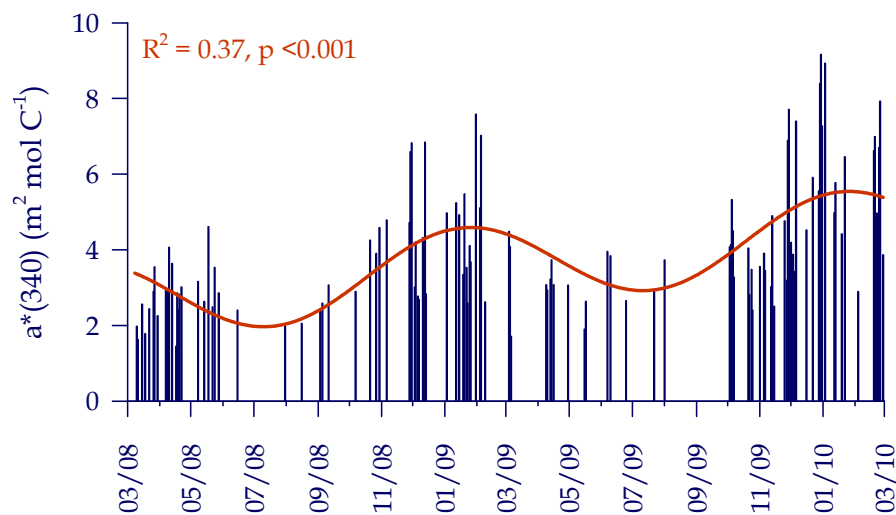


CDOM in rain water to the Ría de Vigo

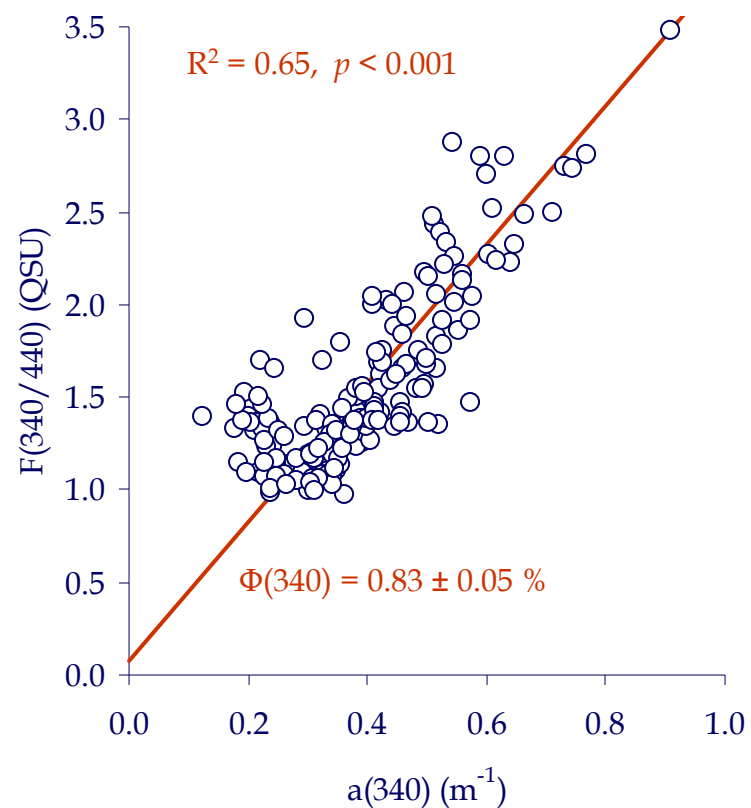
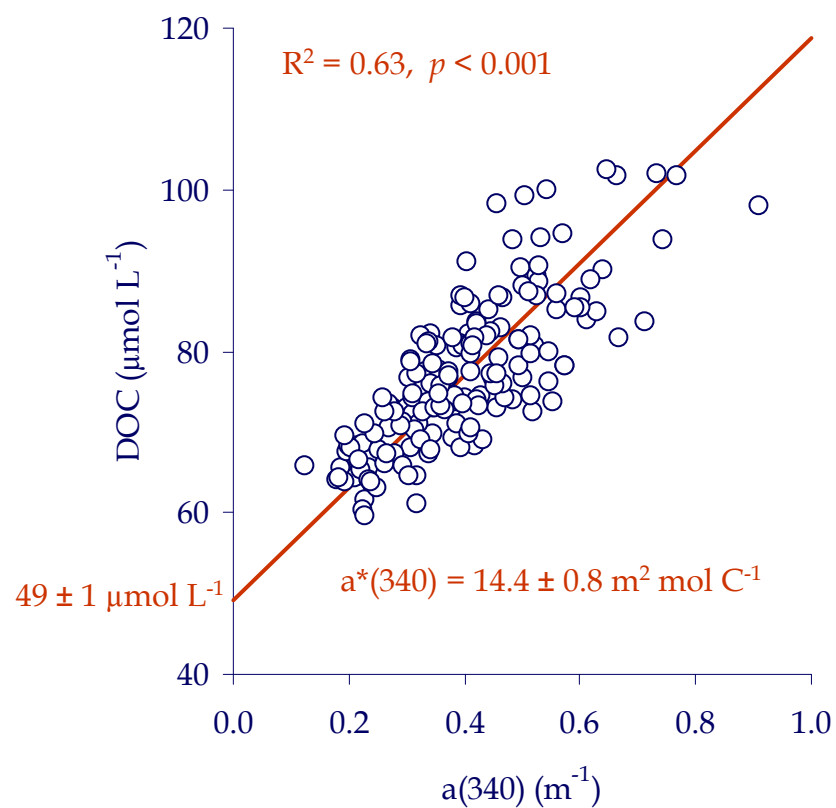
absorbance, induced fluorescence and quantum yield of CDOM



CDOM in rain water to the Ría de Vigo absorbance, induced fluorescence and quantum yield of CDOM

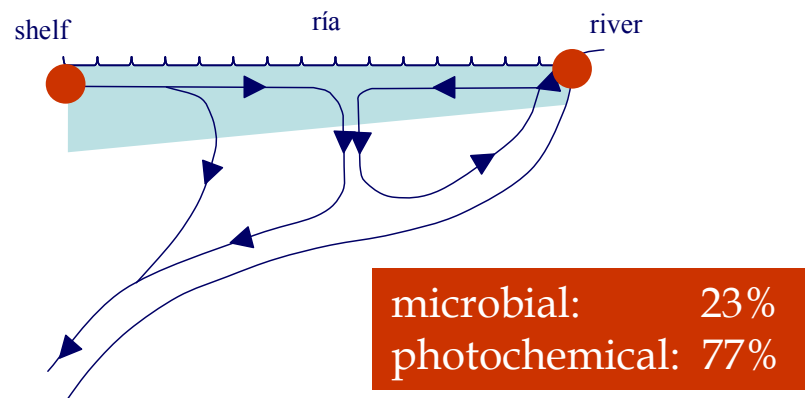
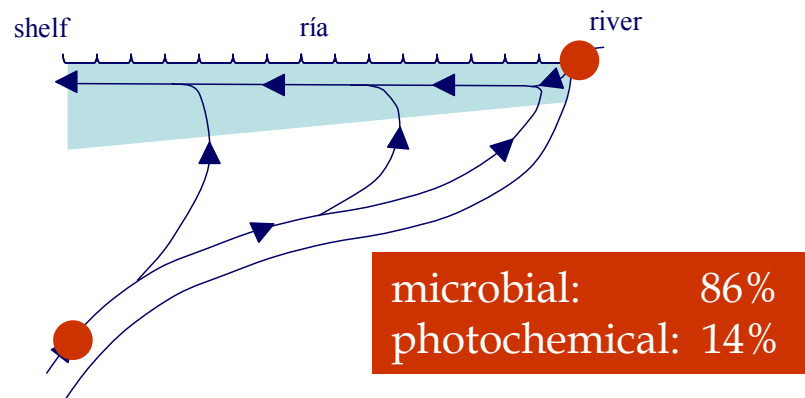


CDOM in marine waters of the Ría de Vigo absorbance, induced fluorescence and quantum yield of CDOM



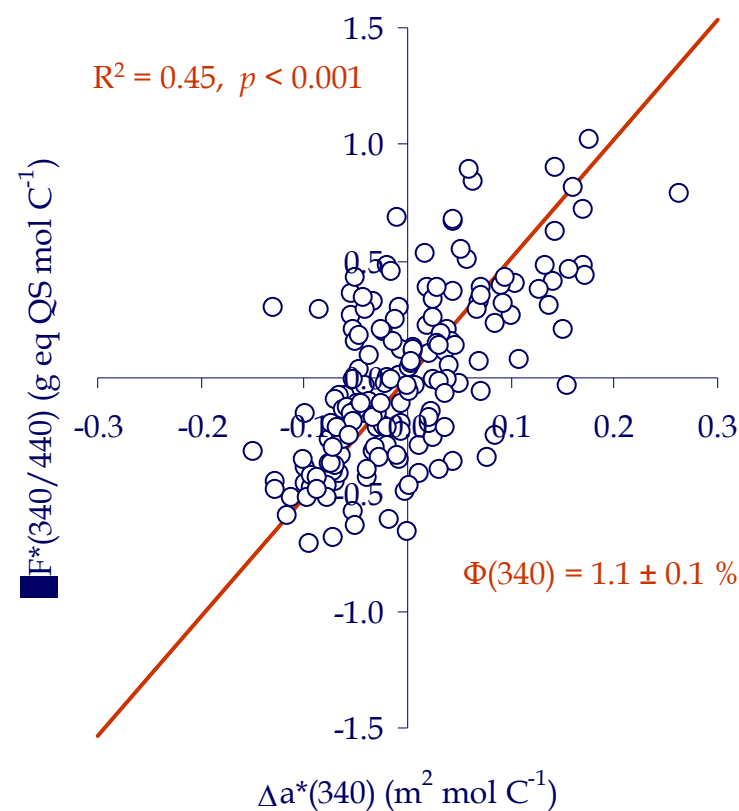
CDOM in marine waters of the Ría de Vigo

absorbance, induced fluorescence and quantum yield of CDOM

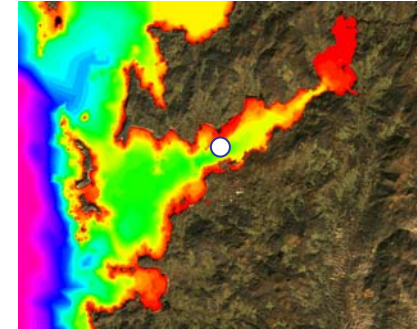
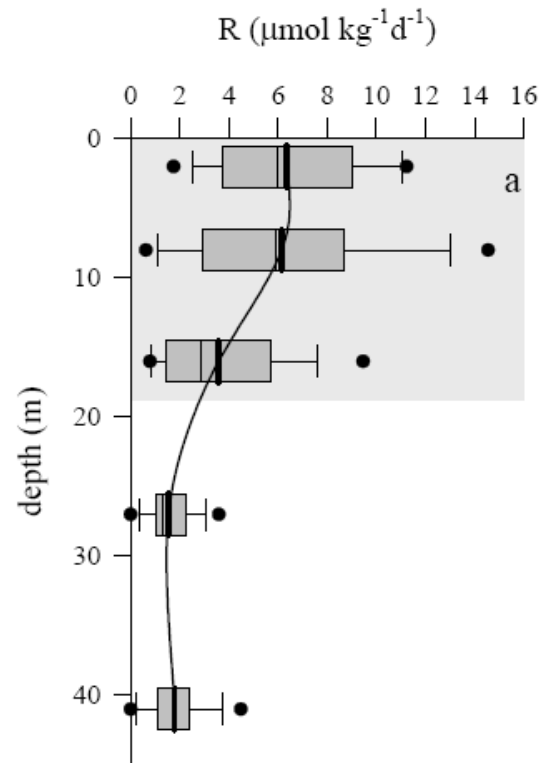


$$Y = \alpha_0 + \alpha_1 \times S$$

$$\Delta Y = Y - \alpha_0 - \alpha_1 \times S$$

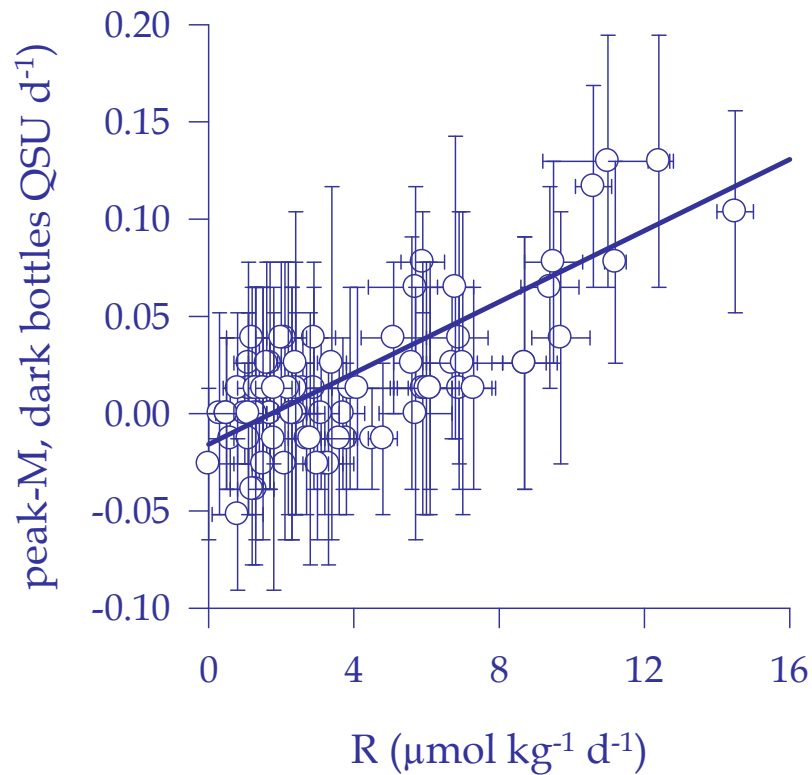


in vitro net (microbial) community production (NCP) of FDOM daily production of marine humic-like substances



- ▶ sixteen visits through the seasonal cycle, five depths
- ▶ incubated 24 hours at *in situ* light and temperature conditions

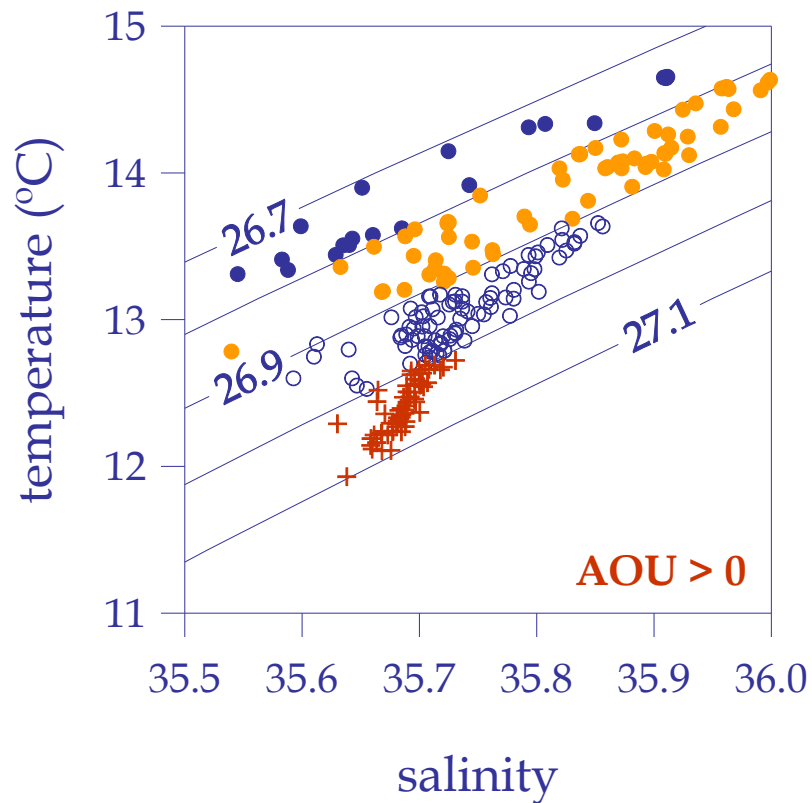
in vitro net (microbial) community production (NCP) of FDOM
daily production of marine humic-like substances



$$\Delta\text{FDOMm}/\Delta R = 8.1 (\pm 0.9) 10^{-3} \mu\text{g eq QS } (\mu\text{mol O}_2)^{-1}$$

$$R^2 = 0.54, n = 79, p < 0.001$$

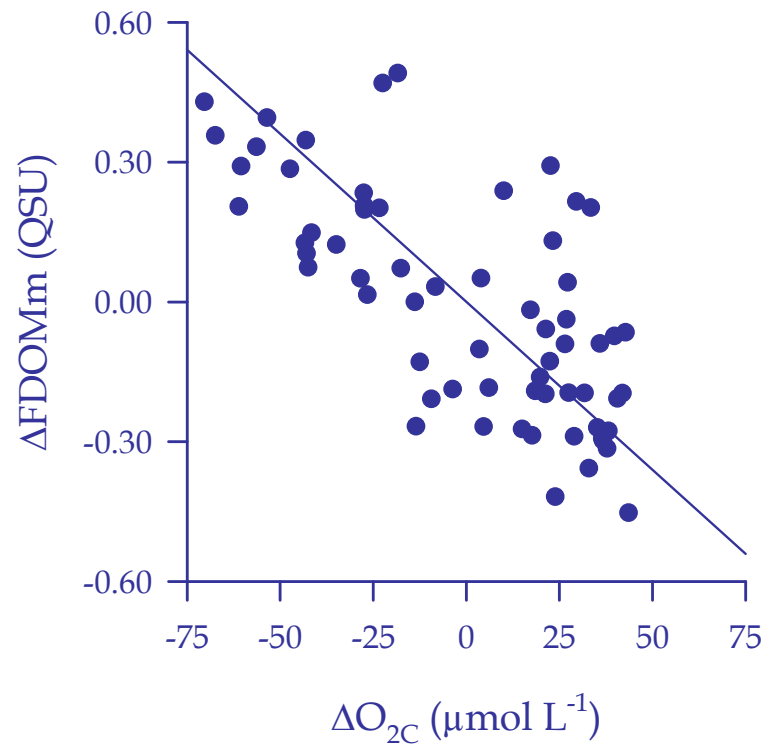
in situ net (microbial) community production (NCP) of FDOM
separating water mass mixing from microbial production of FDOM



$$\begin{aligned} \text{FDOMm} &= \alpha_0 + \alpha_1 \times S \\ \text{O}_2 &= \beta_0 + \beta_1 \times S \end{aligned}$$

$$\begin{aligned} \Delta \text{FDOMm} &= \text{FDOMm} - \alpha_0 - \alpha_1 \times S \\ \Delta \text{O}_2 &= \text{O}_2 - \beta_0 - \beta_1 \times S \end{aligned}$$

in situ net (microbial) community production (NCP) of FDOM
separating water mass mixing from microbial production of FDOM



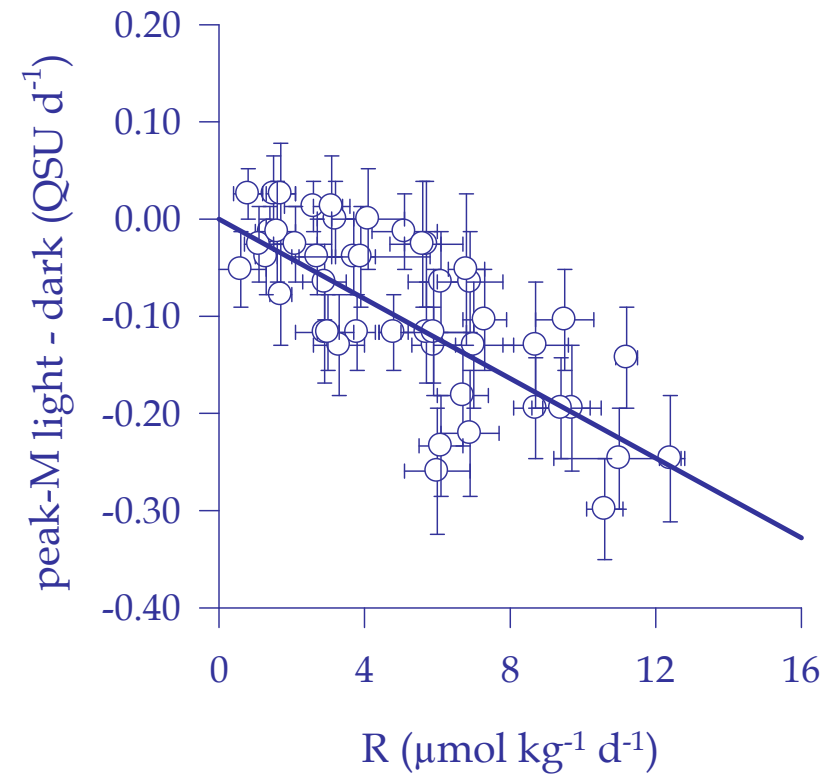
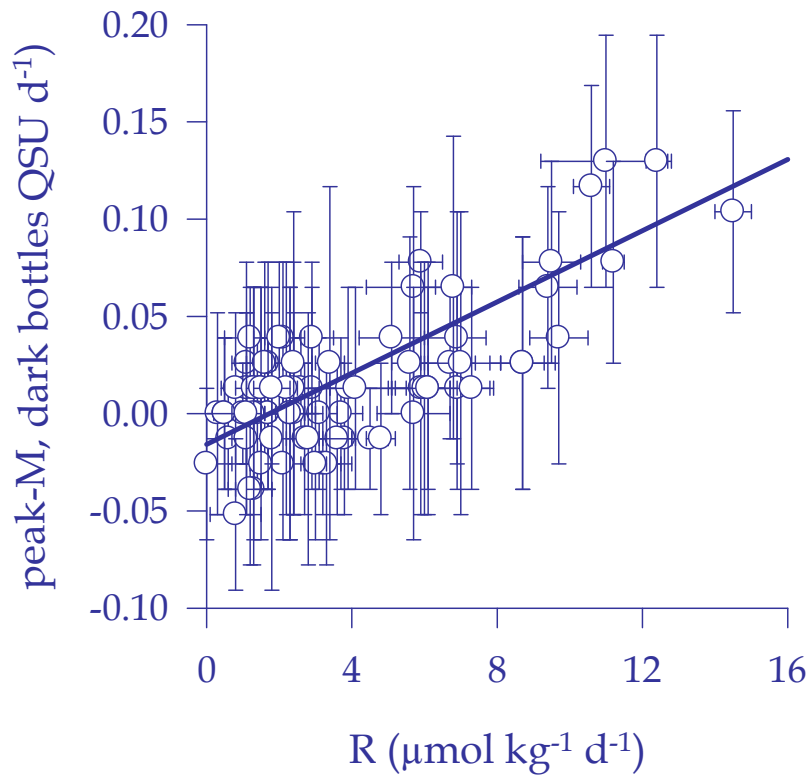
$$\Delta\text{FDOMm}/\Delta\text{O}_2 = -7.5 (\pm 0.6) 10^{-3} \mu\text{g eq QS } (\mu\text{mol O}_2)^{-1}$$

$$R^2 = 0.50, n = 64, p < 0.001$$

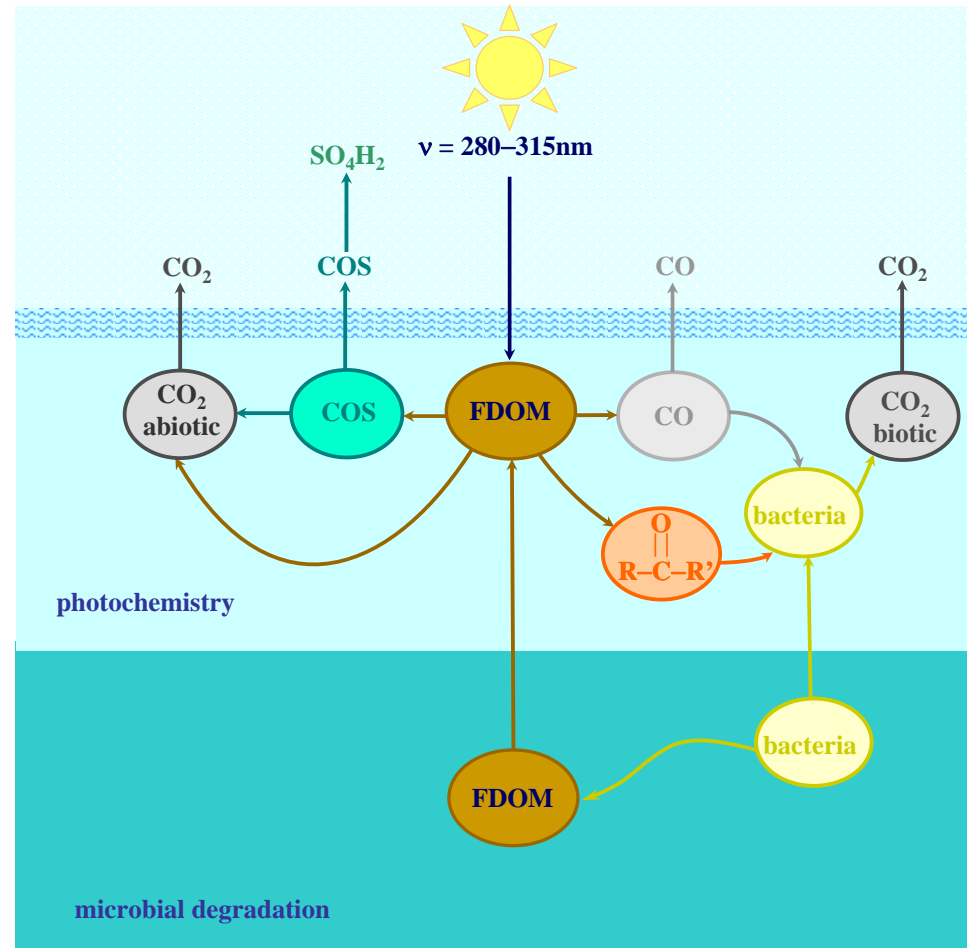
$$\Delta\text{FDOMm}/\Delta\text{R} = 8.1 (\pm 0.9) 10^{-3} \mu\text{g eq QS } (\mu\text{mol O}_2)^{-1}$$

$$R^2 = 0.54, n = 79, p < 0.001$$

in vitro photo-degradation of FDOM
daily photo-bleaching of marine humic-like substances



in vitro photo-degradation of FDOM interactions microbial production-photodegradation



in vitro net heterotrophic community production of FDOM long-term net production of protein- and marine humic-like substances



t = 0



t = 1 d



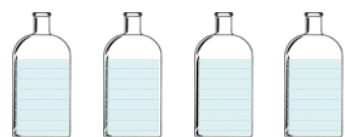
t = 2 d



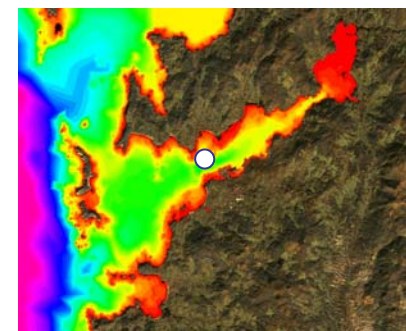
t = 4 d



t = 10 d



t = 50-70 d



- ▶ twelve visits through the seasonal cycle, one depth
- ▶ surface water filtered through 0.2 μm
- ▶ mixed with 10% the same water filtered 1.2 μm
- ▶ incubated in the dark at 15°C from 50 to 70 days

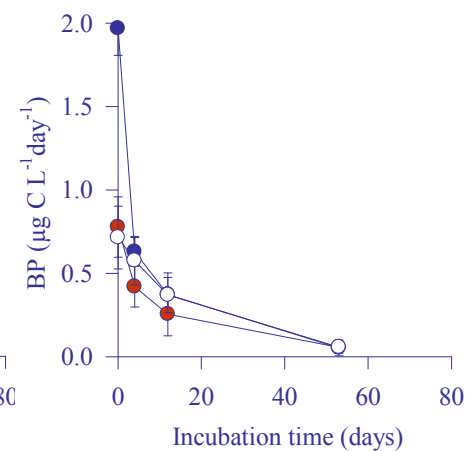
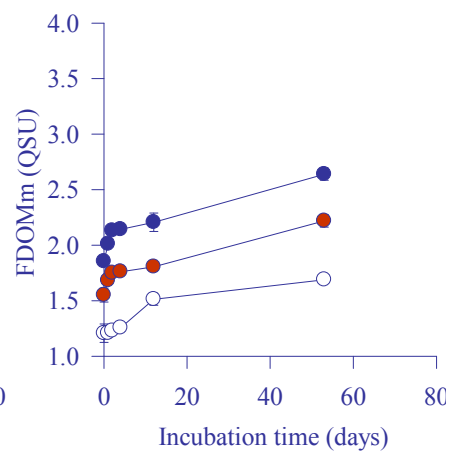
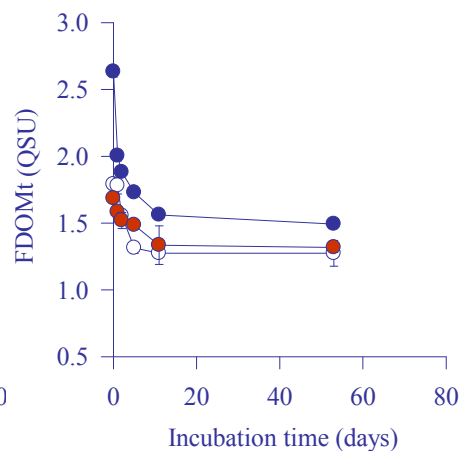
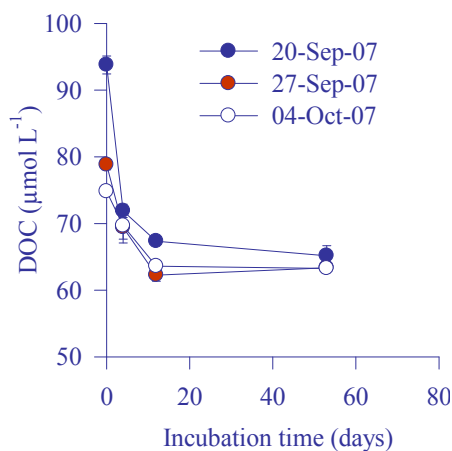
in vitro net heterotrophic community production of FDOM

kinetics of the net production of protein- and marine humic-like substances

$$\text{DOC}(t) = \text{BDOC} \cdot \exp(-k_{\text{DOC}} \cdot t) + \text{RDOC}$$

$$\text{FDOMm}(t) = \text{PFDOMm} \cdot [1 - \exp(-k_{\text{M}} \cdot t)] + \text{FDOMm}(0)$$

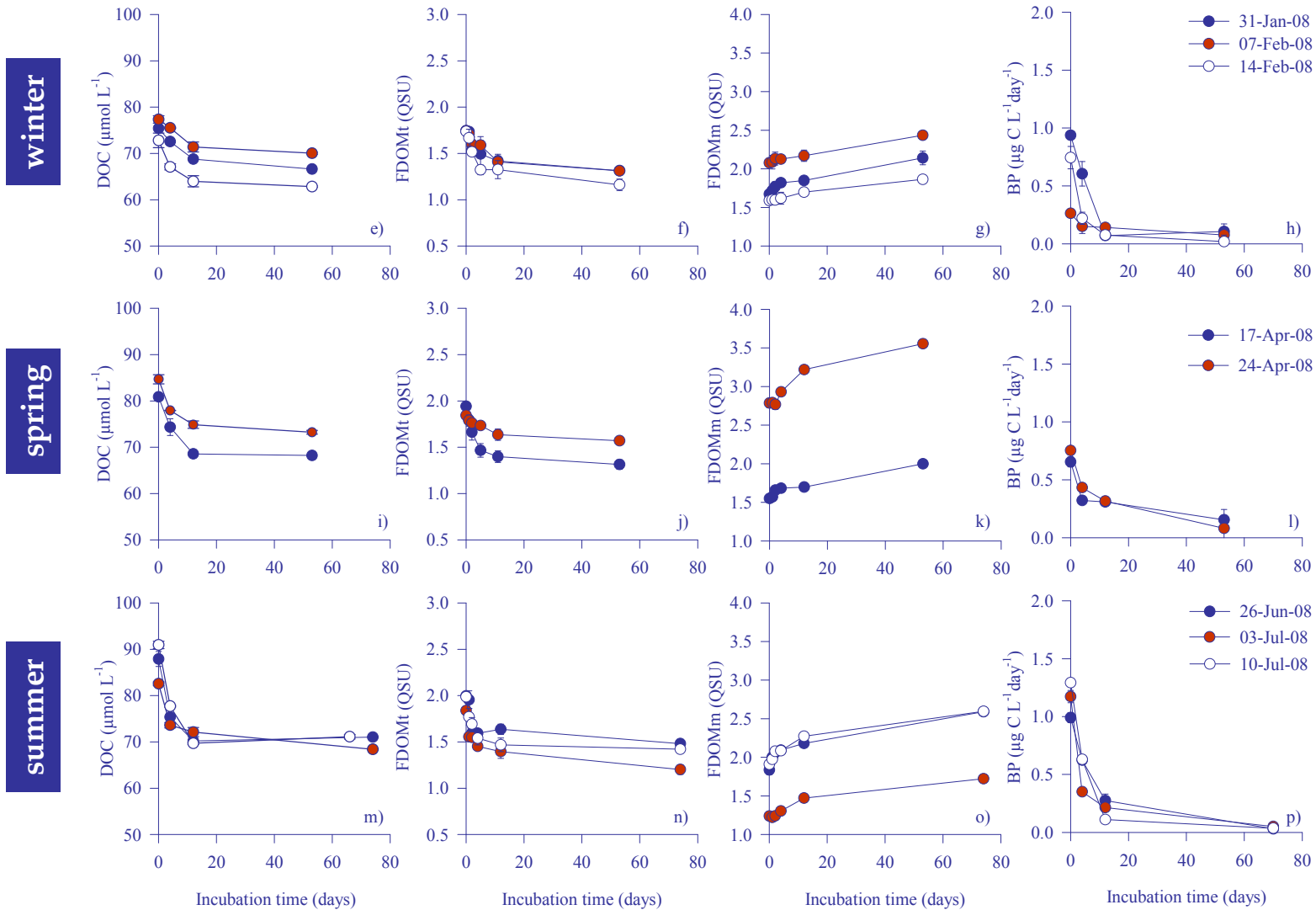
autumn



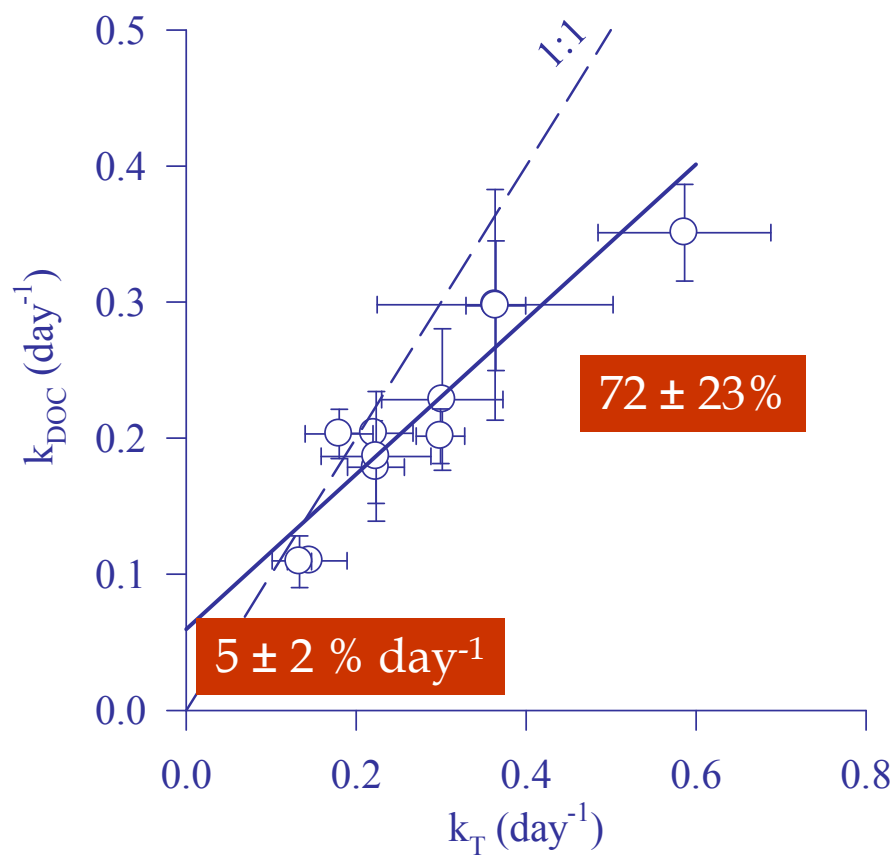
$$\text{FDOMt}(t) = \text{BFDOMt} \cdot \exp(-k_{\text{T}} \cdot t) + \text{RFDOMt}$$

in vitro net heterotrophic community production of FDOM

kinetics of the net production of protein- and marine humic-like substances

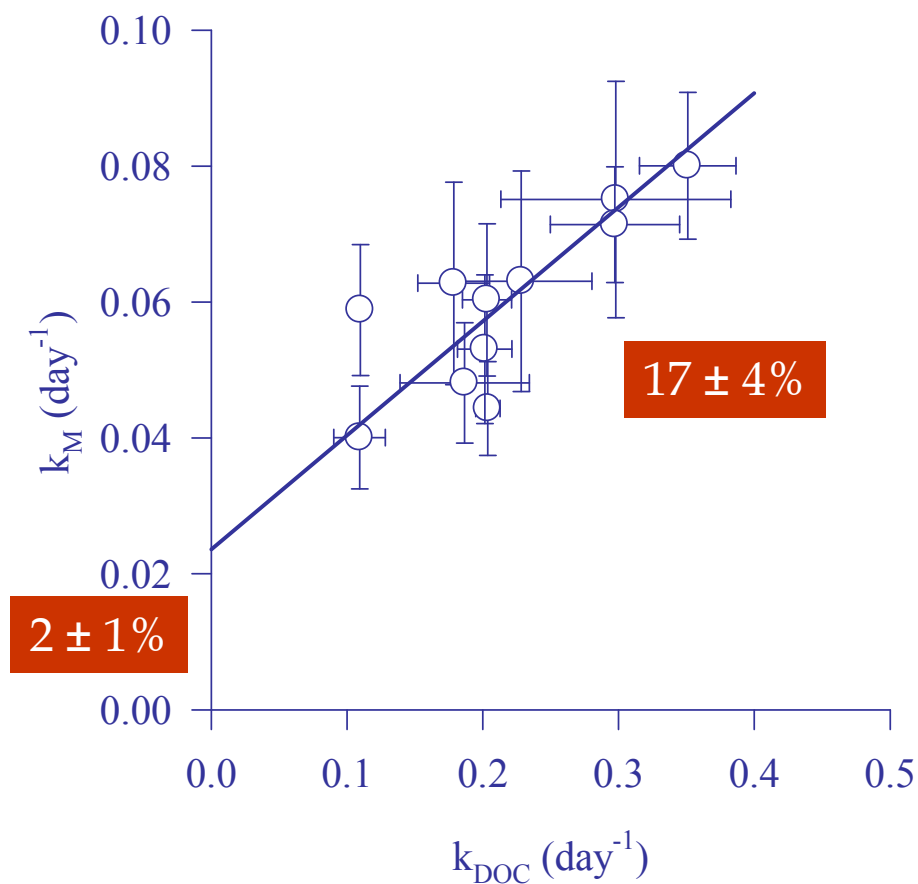


in vitro net heterotrophic community production of FDOM
kinetics of the net production of protein- and marine humic-like substances



$$k_{\text{DOC}} = 0.05(\pm 0.02) + 0.58(\pm 0.08) \cdot k_{\text{T}}$$
$$R^2 = 0.86, p < 0.001$$

in vitro net heterotrophic community production of FDOM
kinetics of the net production of protein- and marine humic-like substances



$$k_M = 0.02(\pm 0.01) + 0.17(\pm 0.04) \cdot k_{DOC}$$
$$R^2 = 0.64, p < 0.01$$

¡Gracias por vuestra atención!
Thank you for your attention!