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Investigating the *in-situ* bacterial production of aquatic fluorescent organic matter in a freshwater laboratory model

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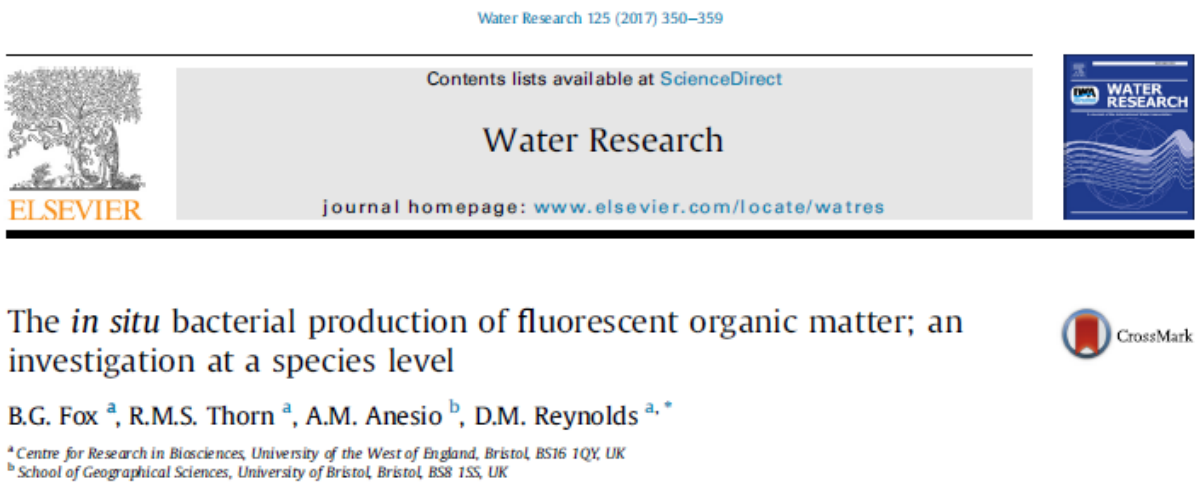
UWE Bristol | University of the West of England

Emerging concepts in AFOM



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The *in situ* bacterial production of fluorescent organic matter; an investigation at a species level

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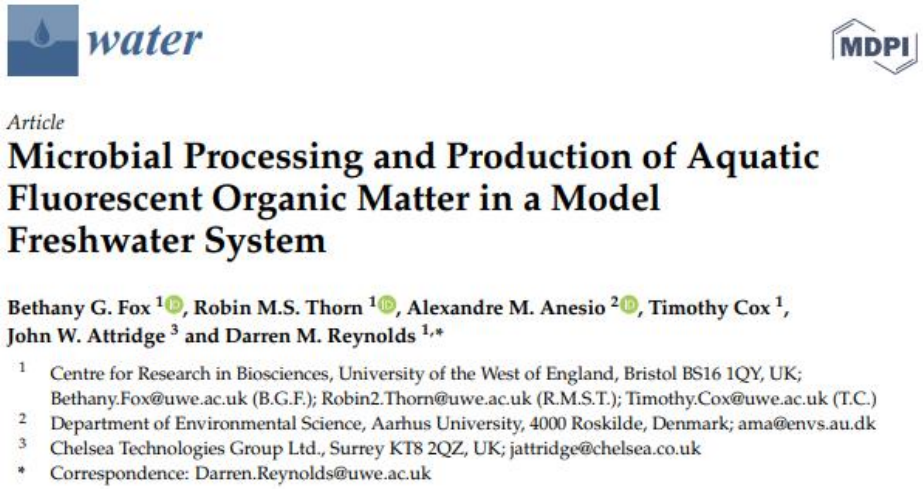
- Demonstrated that Peak T fluorescence does not directly correlate with bacterial cell density
- AFOM production differs between different bacterial laboratory strains



water

MDPI

Article

Microbial Processing and Production of Aquatic Fluorescent Organic Matter in a Model Freshwater System

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- High-nutrient (organic and inorganic) model system used
- *In-situ* Peak C production demonstrated

Research Aims & Objectives

Aim

The development of a simulated freshwater model to further elucidate the role that microorganisms play in the mediation of AFOM

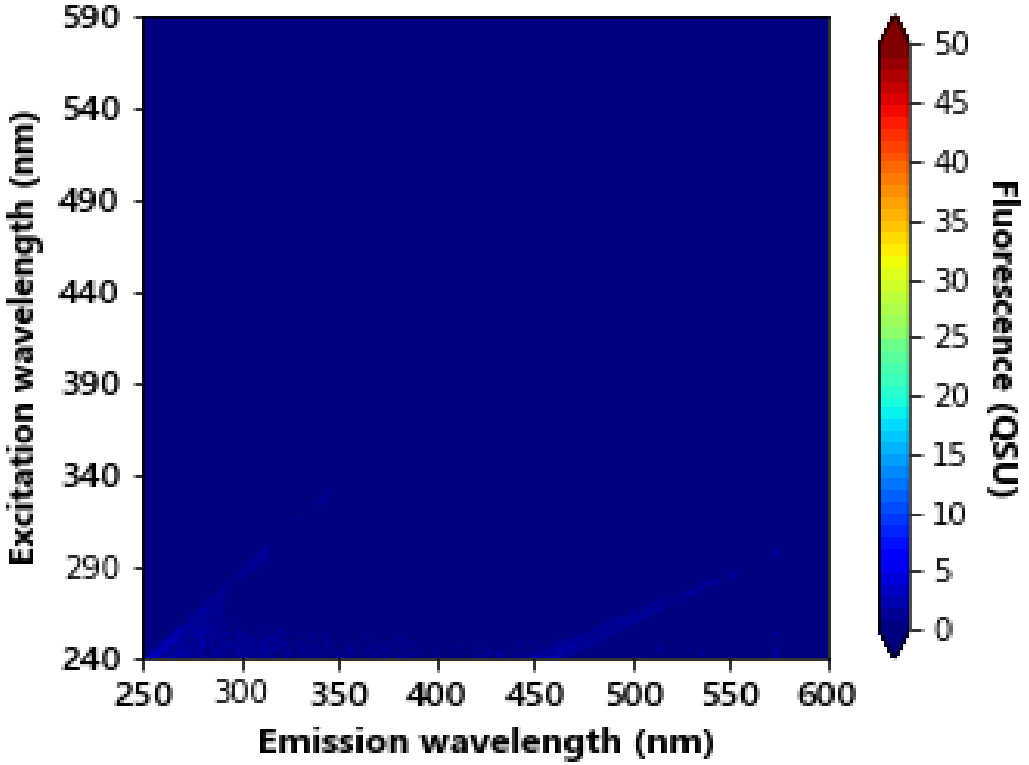
Objectives

- To develop a representative freshwater low-nutrient and non-fluorescent matrix
- To investigate the impact of nutrient availability (Nitrate, Phosphate, Carbon)
- To inform understanding of how fluorescence characteristics of the fluvial DOM pool change over time in real aquatic systems

Development of a simulated freshwater model

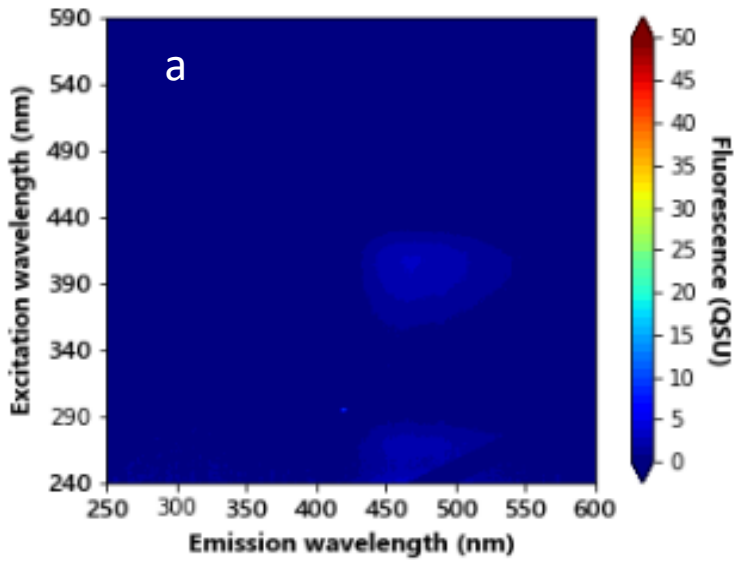
- Non-fluorescent
- Oligotrophic
- Representative ionic constituents of freshwater
- No additional carbon source*
- 37°C
- Bacterial inoculum of *Pseudonomas aeruginosa NCIMB 8295*

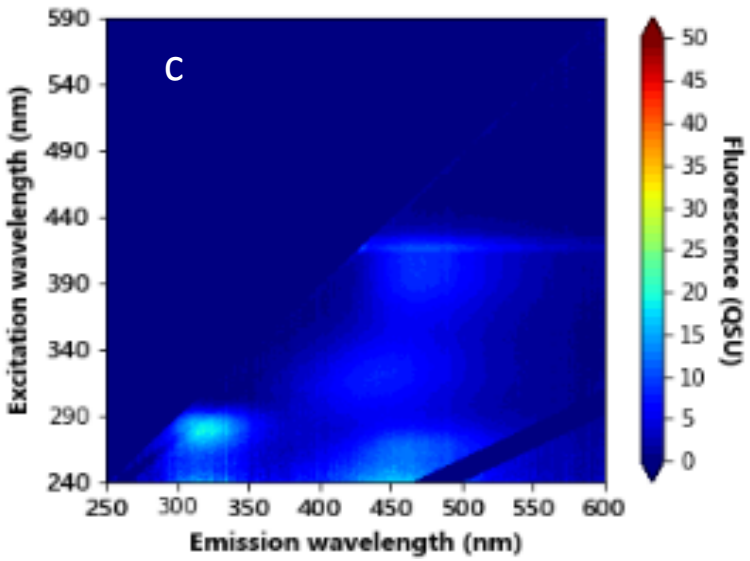
*Smith *et al.,* 2002

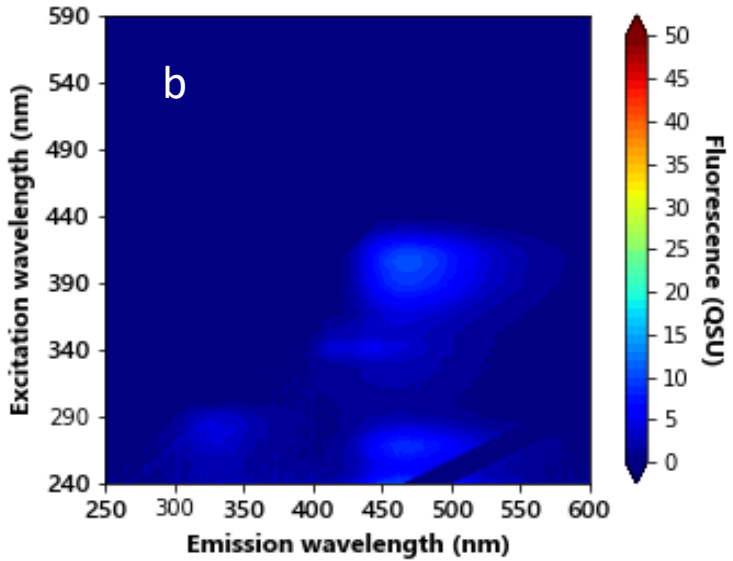


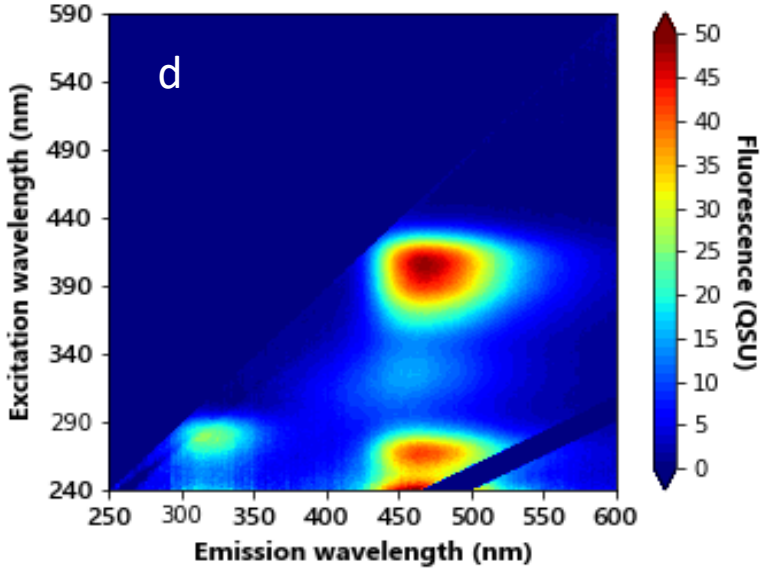
Excitation-Emission Matrix of the simulated freshwater model at 0hrs following inoculation

Bacterial production of AFOM peaks over time





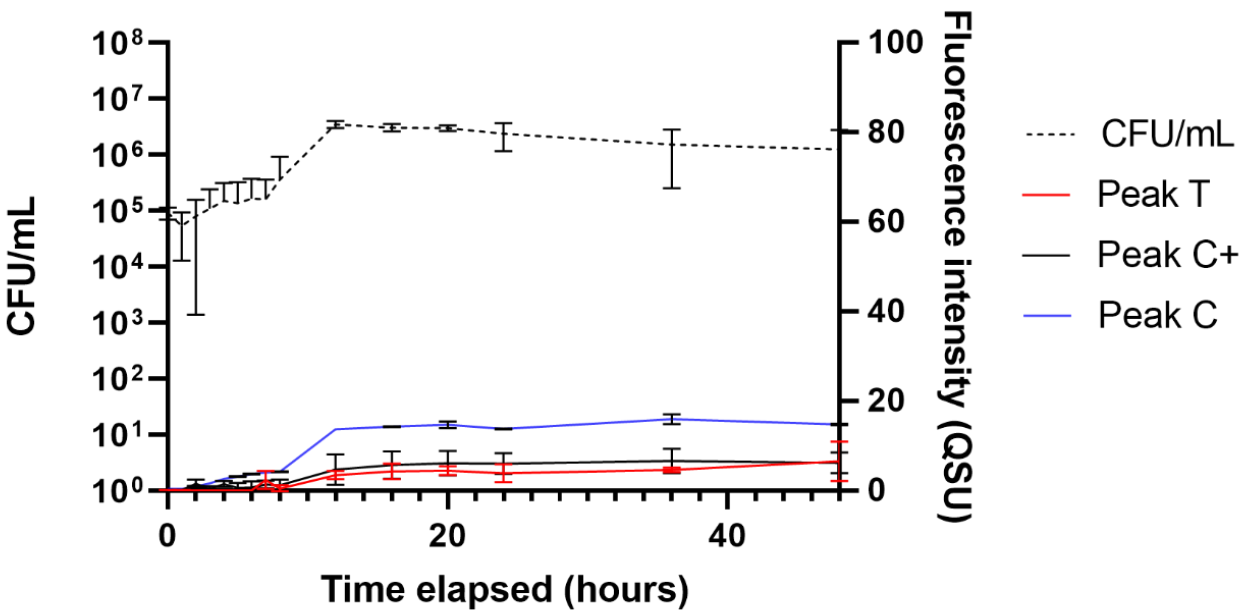




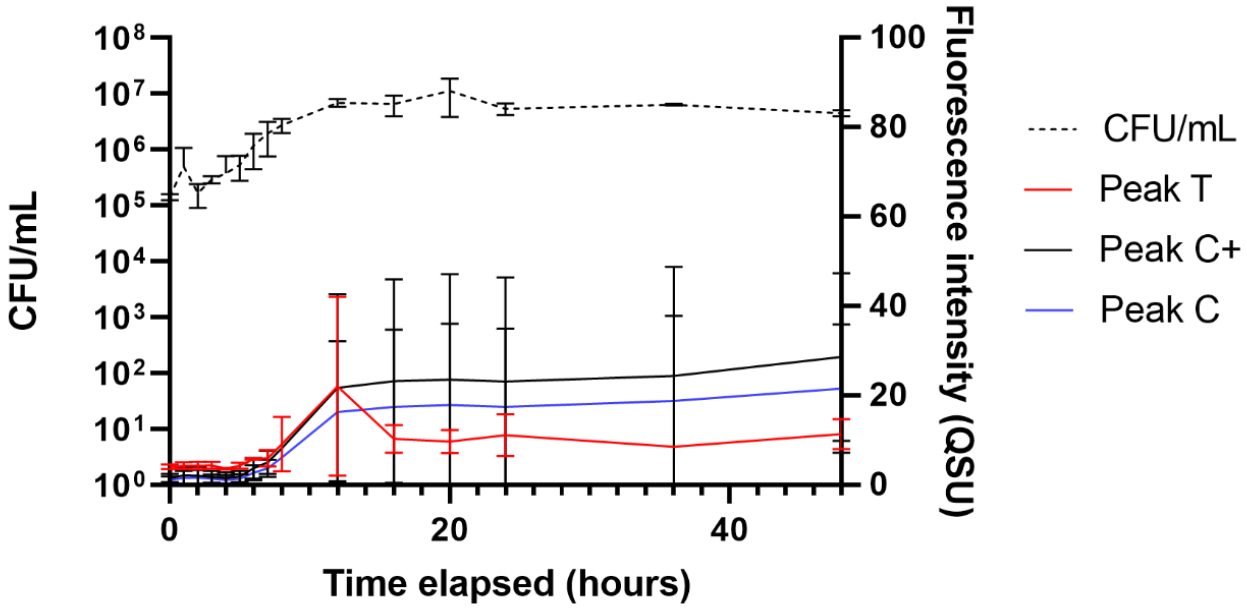
Left: Oligotrophic conditions (0.3mg/L NO_3^- , 0mg/L PO_4^-) at a) 8hrs and b) 48hrs

Right: High-nutrient conditions(50mg/L NO_3^- , 0.1mg/L PO_4^-) at c) 8hrs and d) 48 hrs

Bacterial mediation of AFOM over time



Oligotrophic conditions(0.3mg/L NO_3^- , 0mg/L PO_4^-)



High-nutrient conditions (50mg/L NO_3^- , 0.1mg/L PO_4^-)

Preliminary findings

- This model presents the opportunity to test hypotheses relating to microbial AFOM processing in a controlled laboratory environment that is more representative.
- Bacteria (even monocultures) are capable of producing a range of AFOM peaks from very basic chemical constituents
- This includes AFOM in the high molecular-weight fluorescence region, associated with allochthonous material
- The availability of carbon, nitrate and phosphate is an important precursor to the production of AFOM

Thanks for reading

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