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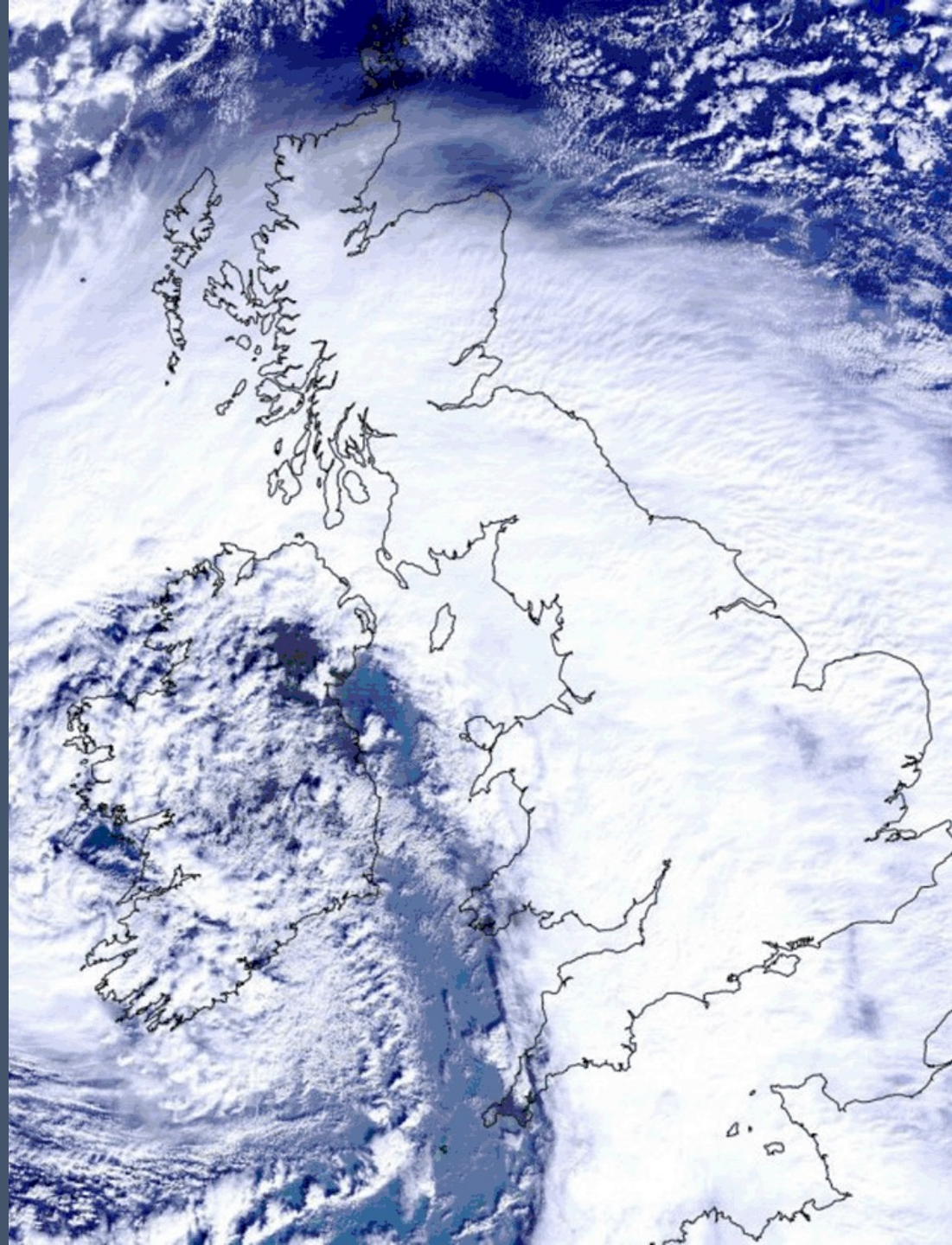
Ocean Colour Activities in NCEO

EO Science for a Changing Planet

Steve Groom, PML/NCEO + many PML and other colleagues



National Centre for Earth Observation

- UK research centre funded by the UK Natural Environment Research Council
- Vision: “Transformational EO science capability to meet Earth System Challenges; EO for a changing planet”
- Income of >£9 million per year
  - > 100 scientists in leading UK universities and research organisations
  - > 150 research papers every year
- Contributions to major, international, environmental science
- Championing the NERC EO community.

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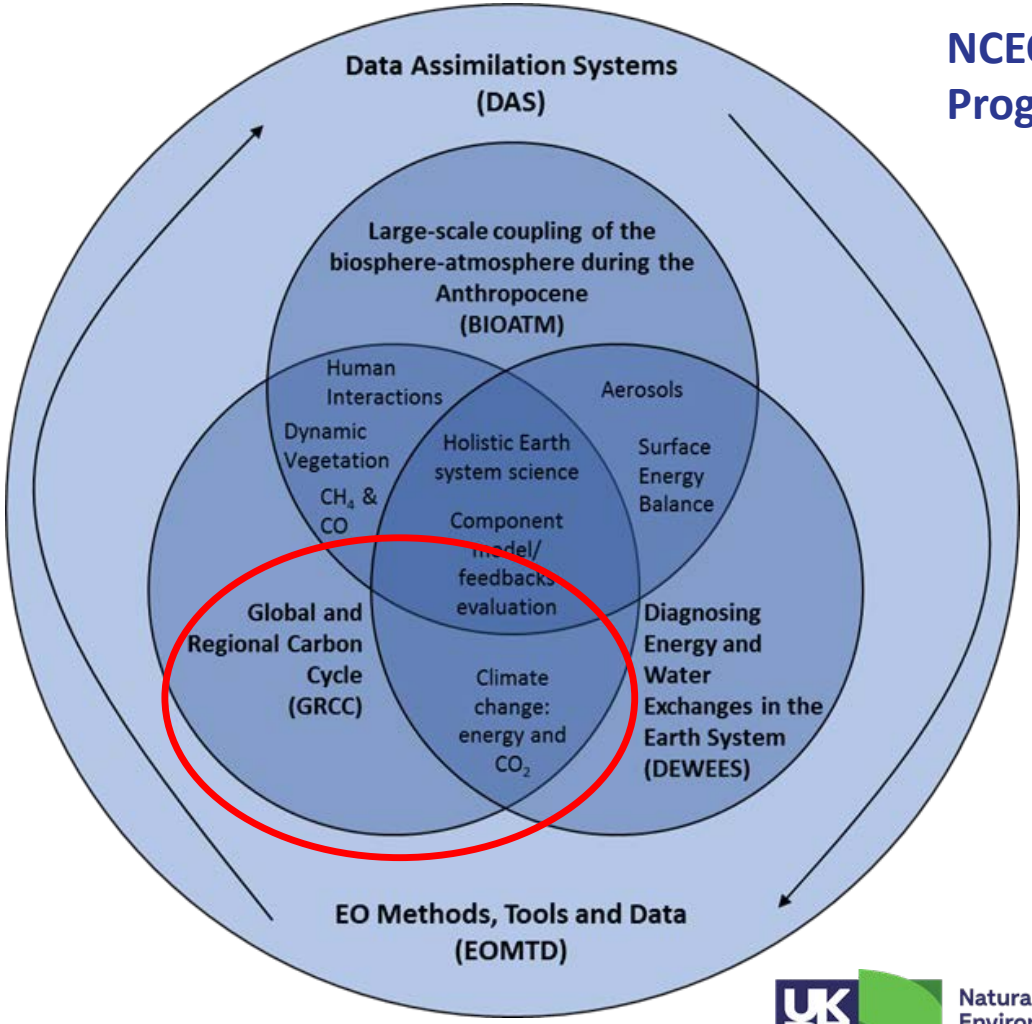
NCEO “National Capability” Science Programmes

- **Long term science**
  - *EO methods, tools and data (Underpinning)*
  - *Data-assimilation systems (Underpinning)*
  - Global and regional carbon cycles
  - ……
- **International Science (ISP)**
- **Data/HPC: CEDA & JASMIN, EO DATA Hub, NEODAAS,**
- **Instruments: FSF (ground, UAVs); NAEO (aircraft)**
- **Other projects: UK EOCIS**

NCEO LTSS Programme



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UKRI Natural Environment Research Council

NCEO "National Capability" Science Programmes: Ocean Colour

- **Long term science**
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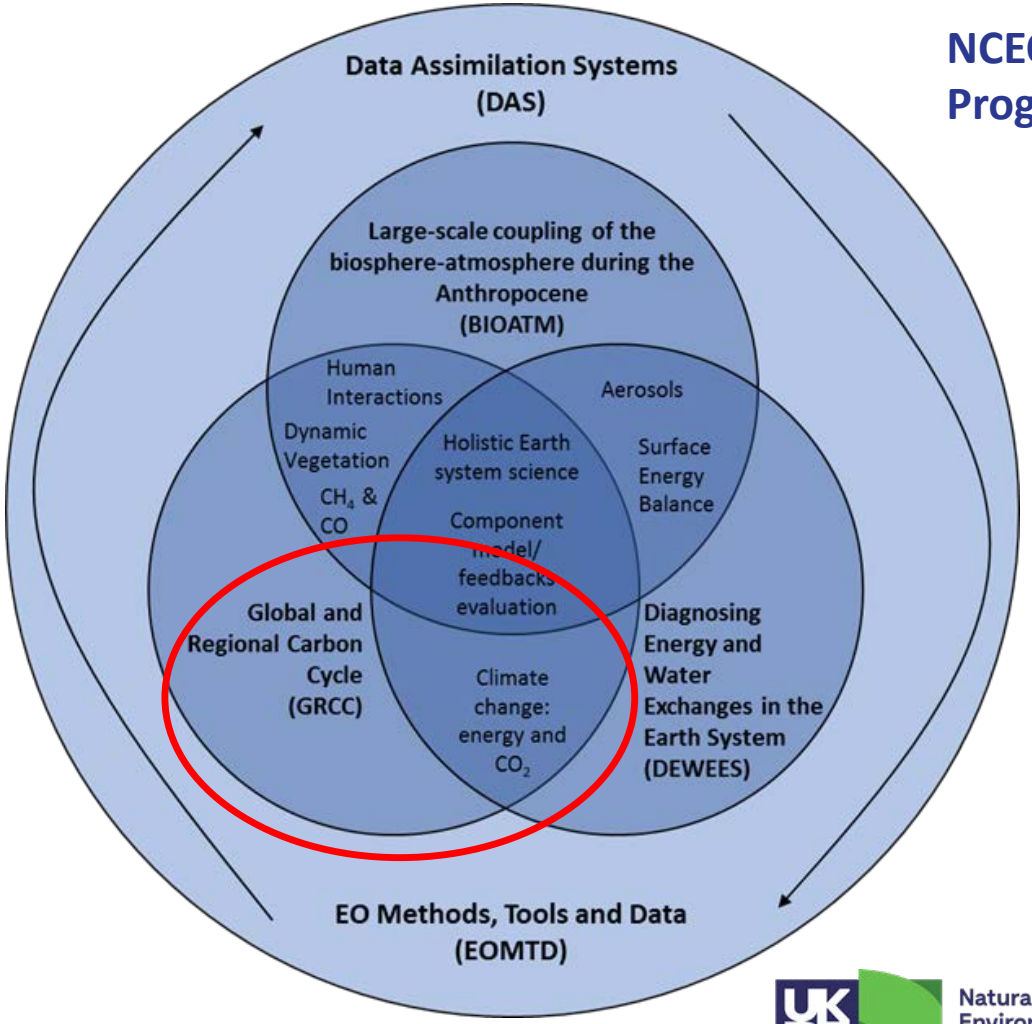

NCEO LTSS Programme

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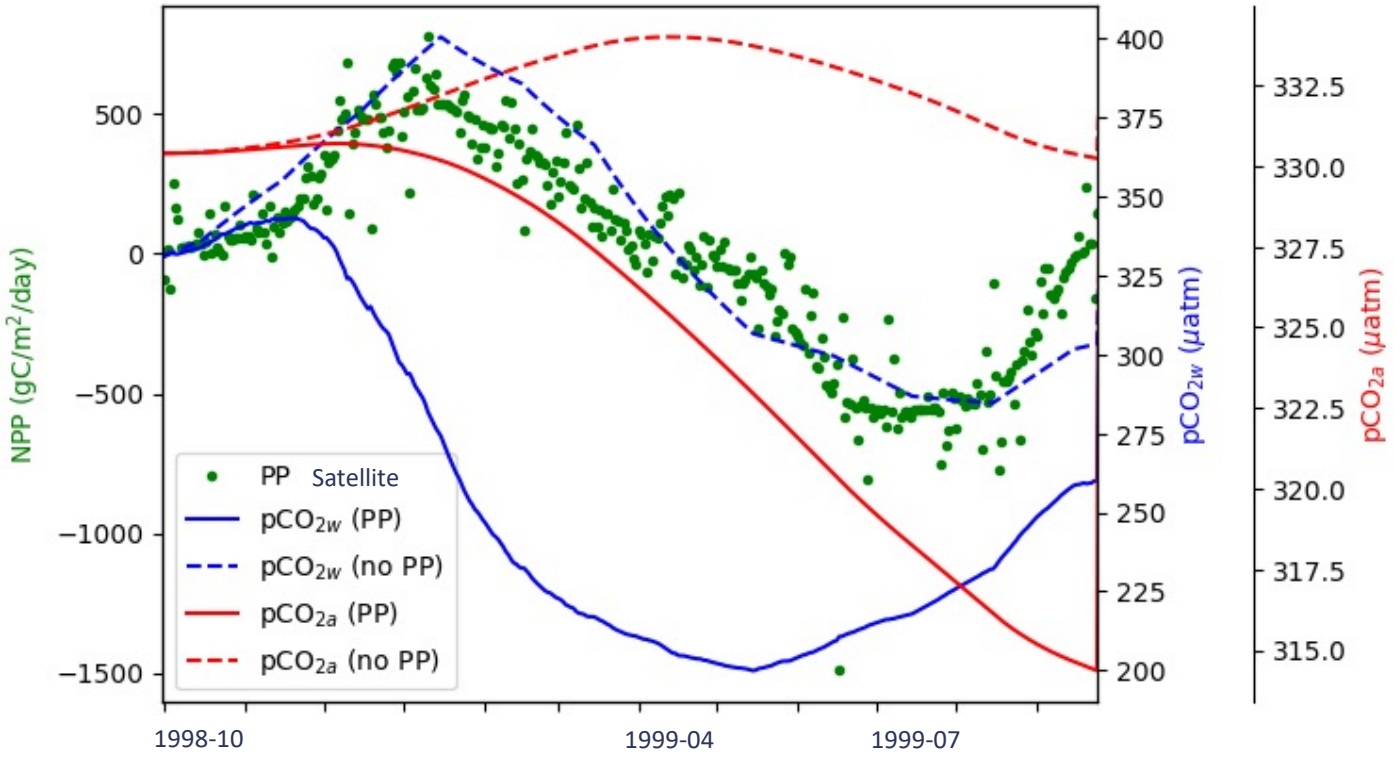
Global and regional carbon cycles: Ocean

- Conventional wisdom is that the effect of ocean biology on atmospheric CO_2 seasonality is negligible because of the long timescale of air-sea equilibration on a global scale.
- Some evidence from a simple model that this timescale can be much shorter than the global average in certain regions.
- Next step is to estimate the actual effect using real data.



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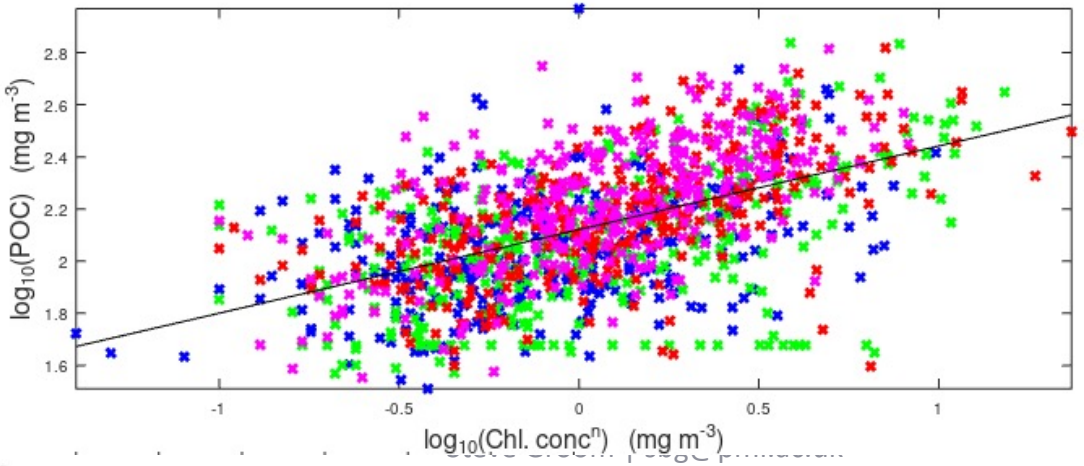
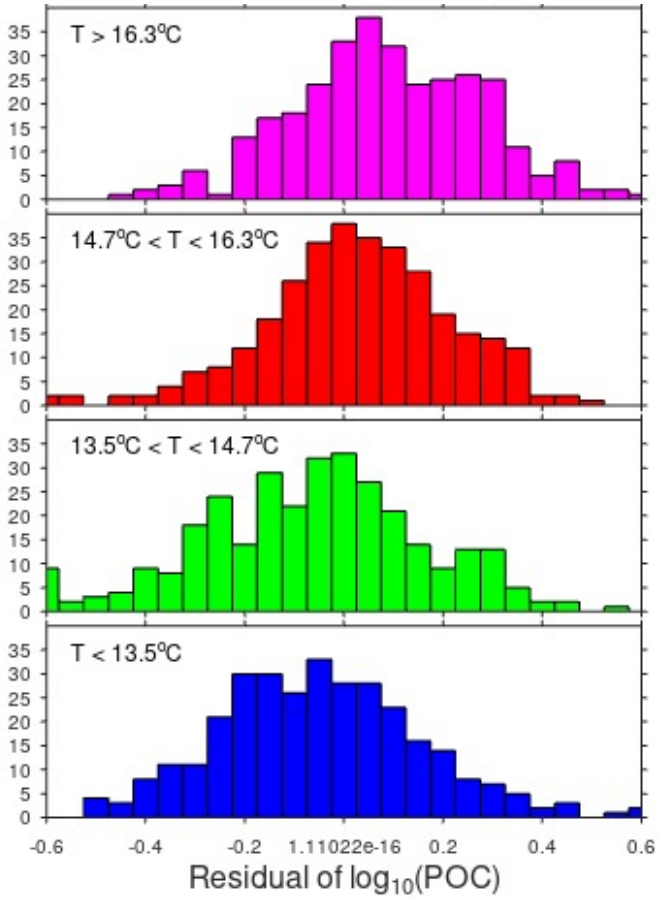
Work by Peter Land and Shubha Sathyendranath, PML

Global and regional carbon cycles: Ocean Part

- Investigating factors affecting Particulate Organic Carbon (POC) in Upwelling Areas
- 30+ years of in situ observations in Iberian Upwelling Zone
- POC is strongly dependent upon biomass (here Chl.)
- Looking at SST, distributions overlap, there is a significant shift in the mean residual, with 7.5% of the variability being explained by temperature





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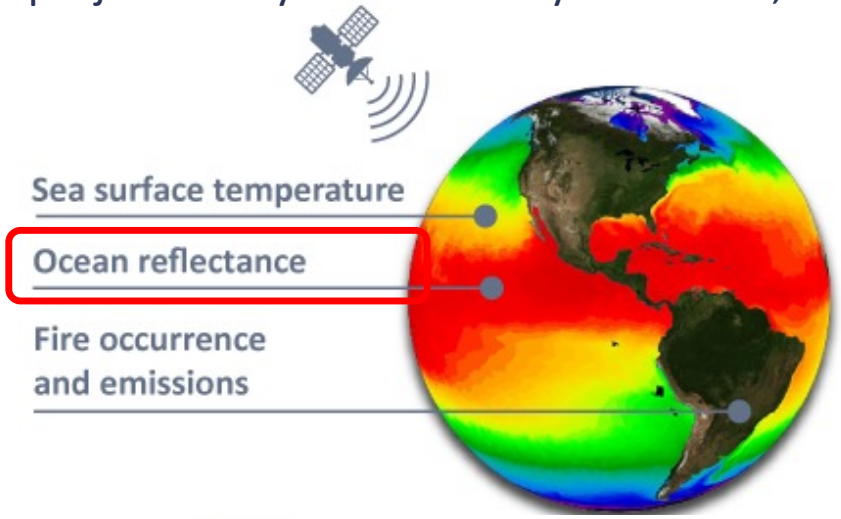
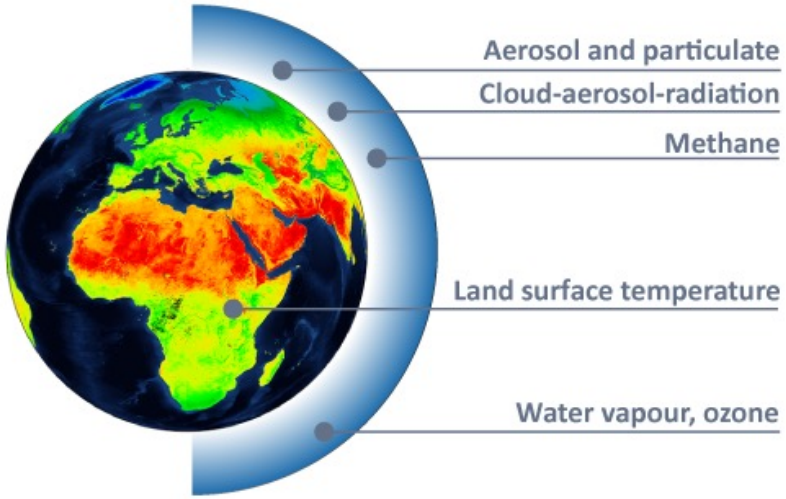
Work by Graham Quartly and Shubha Sathyendranath, PML

UK EO Climate Information Service: Global and High resolution

Ocean reflectance linked to ESA Ocean Colour CCI project led by Shubha Sathyendranath, PML/NCEO





Lake Change linked to ESA Lakes CCI project co-led by Stefan Simis, PML

Coastal water colour linked to EC Horizon 2020 project CERTO

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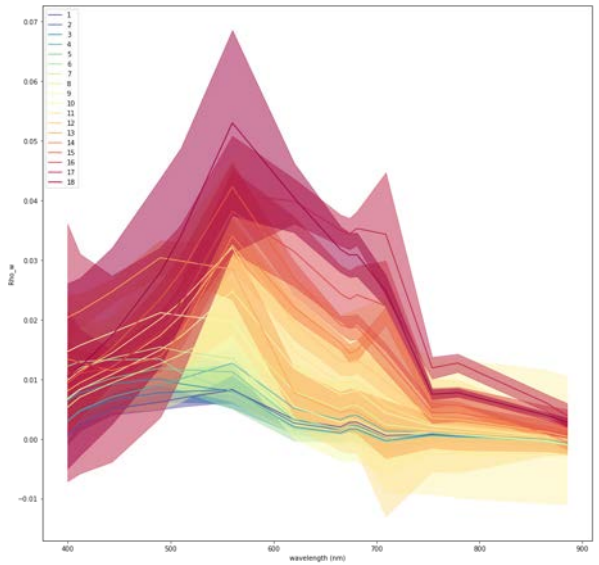
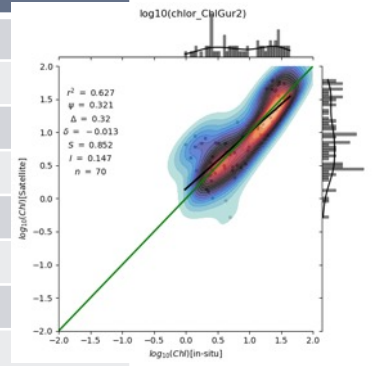
Optical Water Type (OWT)

- OWT method assumes that an optical water type observed in different regions will have the same characteristics → moves away from regional algorithms

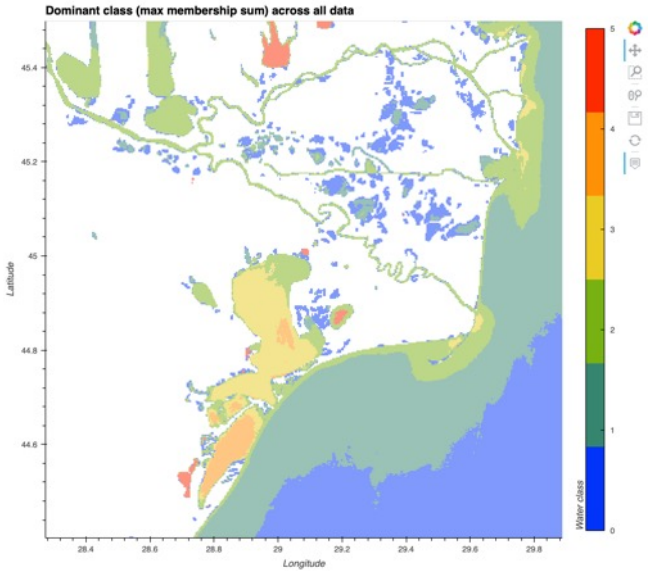


1. Define OWTs with similar optical spectra

OWT Class	Recommended MSI algorithm
1	OC3
2	OC3
3	OC3
4	OC3
5	OC3
6	OC3_warren
7	OC3
8	OC2
9	OC3
10	Gons05
11	OC2



2. Select “best” in-water algorithm per OWT using in situ data



3. Assign to each pixel in space and time membership to a number of classes)

4. Compute, chl-a, TSM) based on OWT membership and individual algorithm statistics for each pixel

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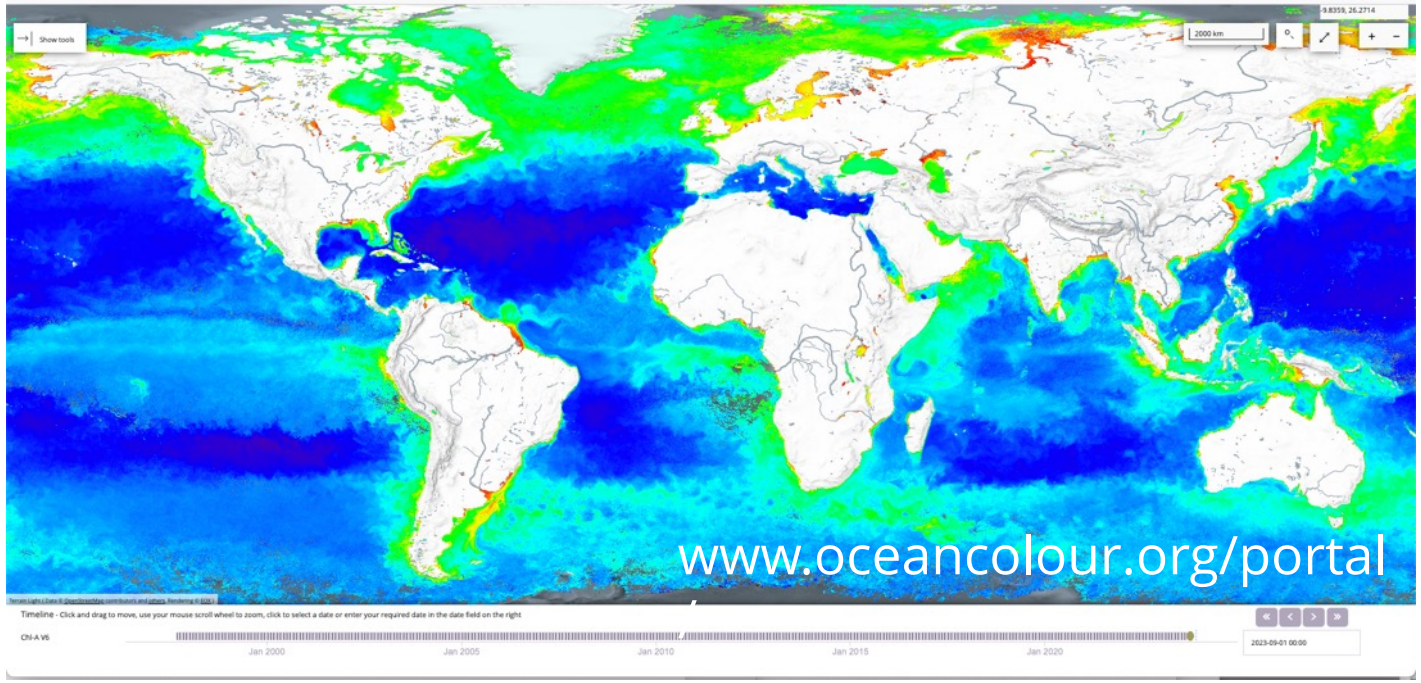
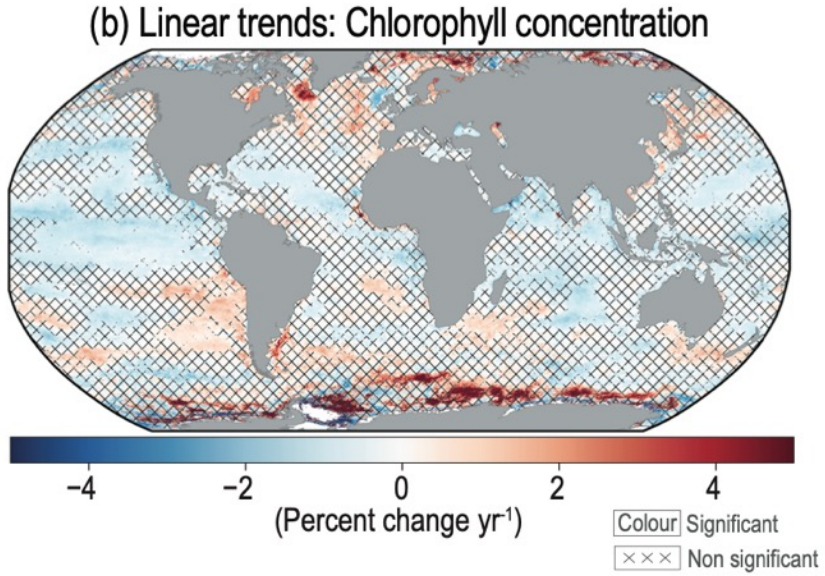
Work by Liz Atwood, PML, Tom Jackson, now at Eumetsat

UK EO Climate Information Service: Global

- EOCIS co-funds work in the ESA Ocean Colour Climate Change Initiative project





- OC CCI v6 chl-a for September 2023 in visualisation portal
- ICDR updates available through Copernicus Climate Change Service

Linear trends (with significance shown) in chlorophyll-a - part of figure 2.31 (IPCC 2021) Chapter 2 of The Physical Science Basis.

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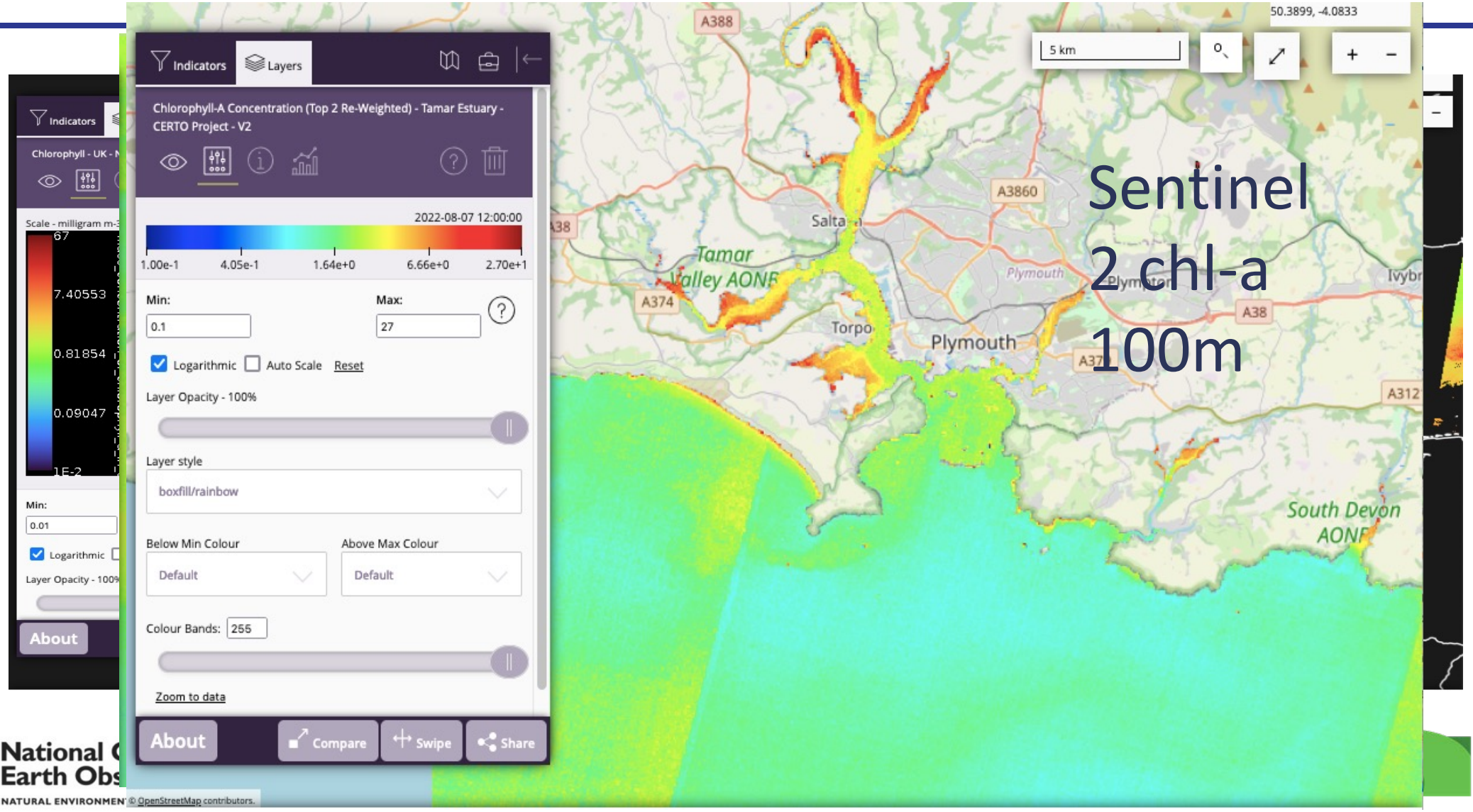
Work by Tom Jackson, Eumetsat, Andrei Chuprin and Shubha Sathyendranath, PML

EOCIS High Resolution Water Quality Products



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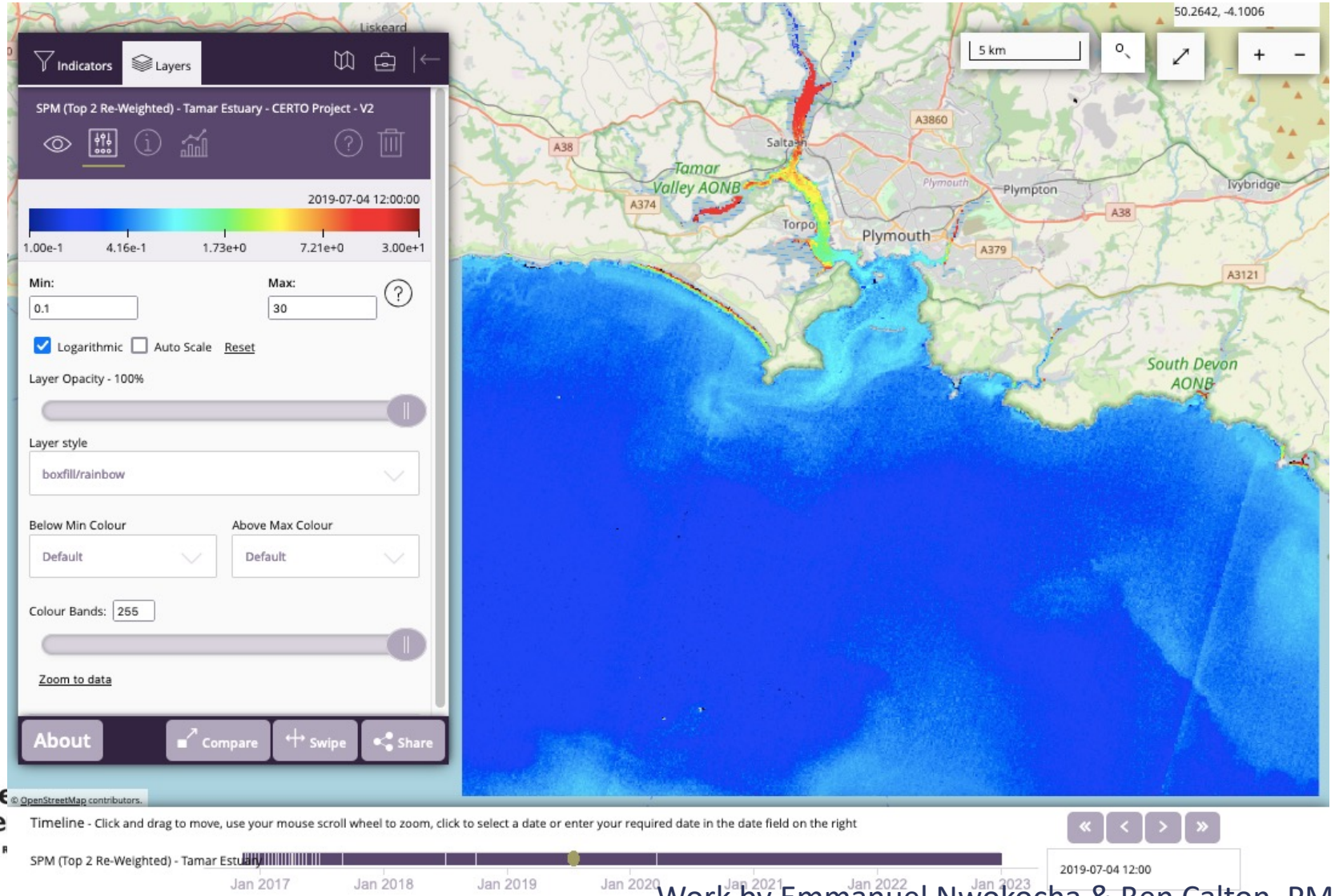
Work by Emmanuel Nwokocha & Ben Calton, PML Applications + CERTO team

EOCIS High Resolution Water Quality Products



Sentinel 2 Suspended Particulate Matter 100m

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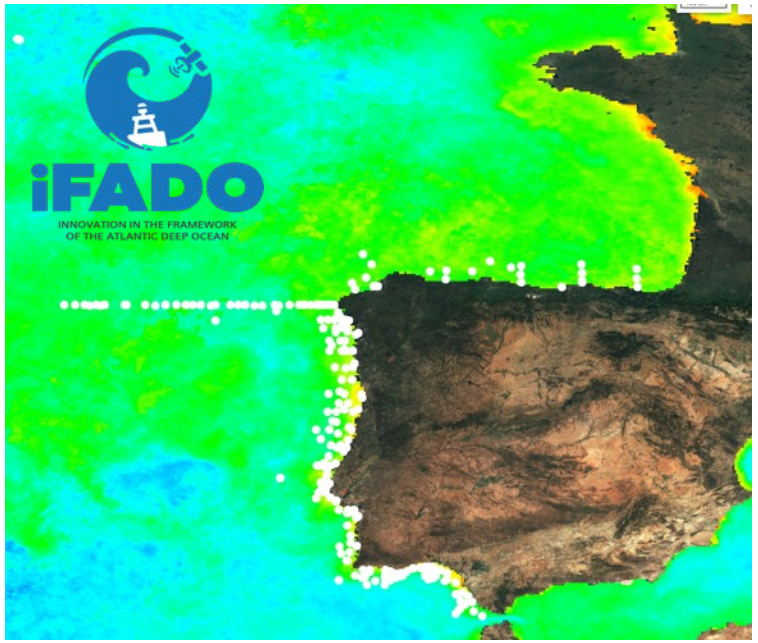
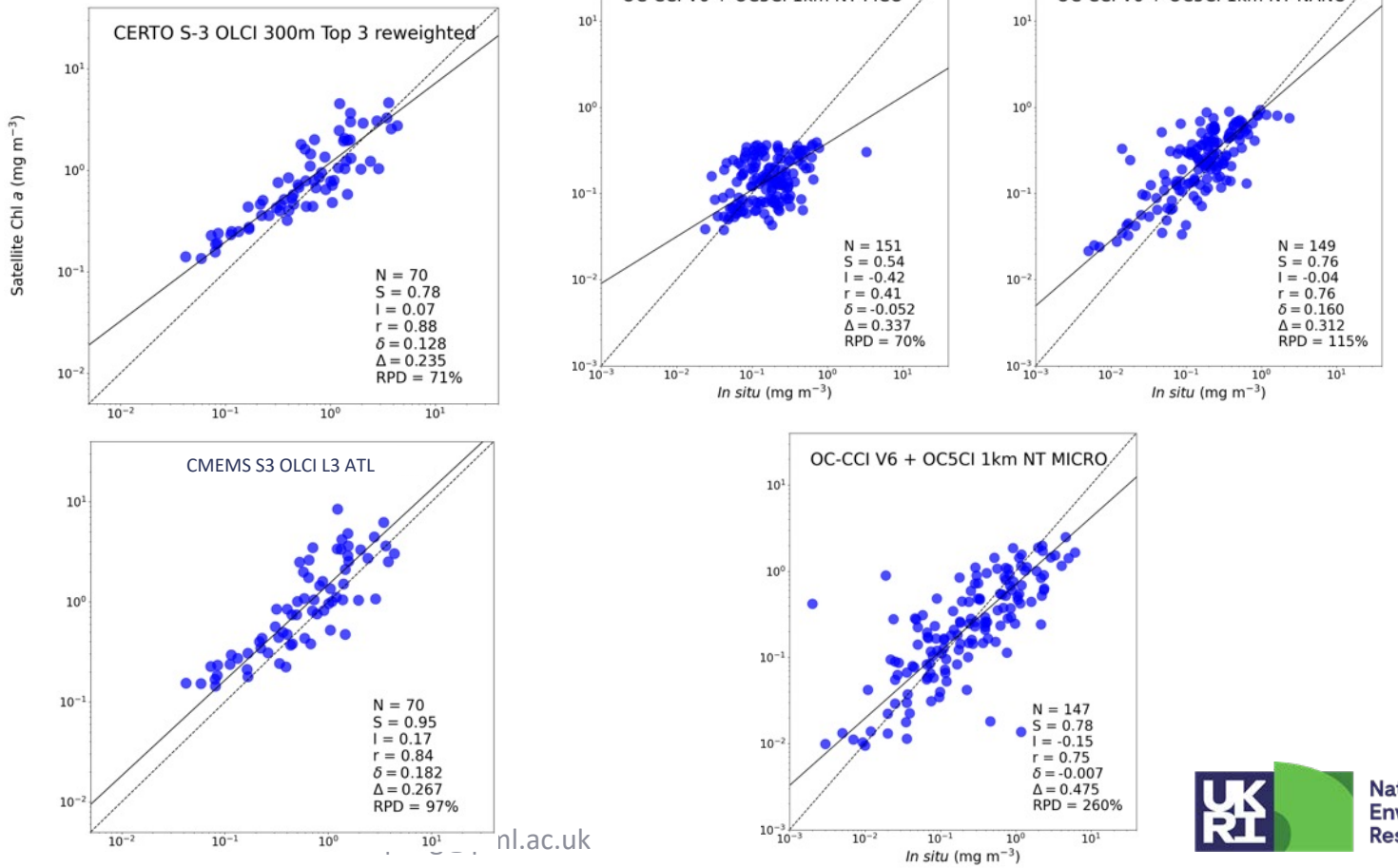
Validation of EOCIS data

- > 300 new HPLC chl-a stations available from 12 cruises, part funded by an Interreg Atlantic Area project “iFADO” processed by U Lisbon





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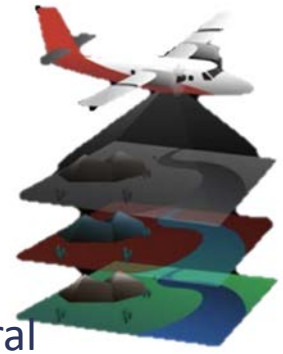
Work by Silvia Pardo-Martinez, PML, Andreia Tracana & Vanda Brotas, U Lisbon

NERC EO Data Analysis and Artificial Intelligence Service (NEODAAS)

Operational Satellite Data Processing inc. ocean colour

Near real-time support and rapid response using satellite data

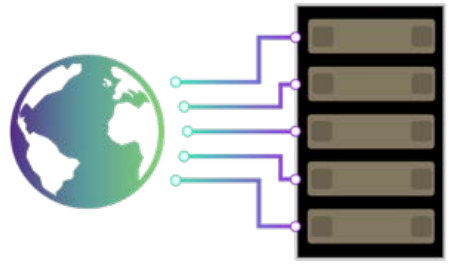
Airborne EO data processing:



hyperspectral vis/NIR/SWIR/thermal; LiDAR

Support, training and outreach e.g., PhD courses

Development of new EO products



Artificial Intelligence / Machine Learning Service

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Thank you

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