The coastal challenge

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Marine Institute
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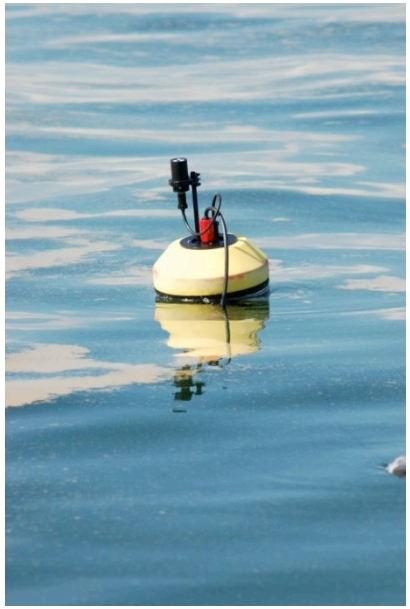
ESA Observation Summer School (4-14 August 2008)

ESA MVT intercalibration workshop at Askö, Sweden – August 2008

Participants from ARGANS and University of Plymouth, UK, Sagremarisco and the University of the Algarve, Portugal, Tartu Observatory, Estonia, ESA/ESTEC, the Netherlands, and Stockholm University. Workshop organised by Susanne Kratzer (Stockhom University)

Full resolution MERIS image just before

Measurement techniques:



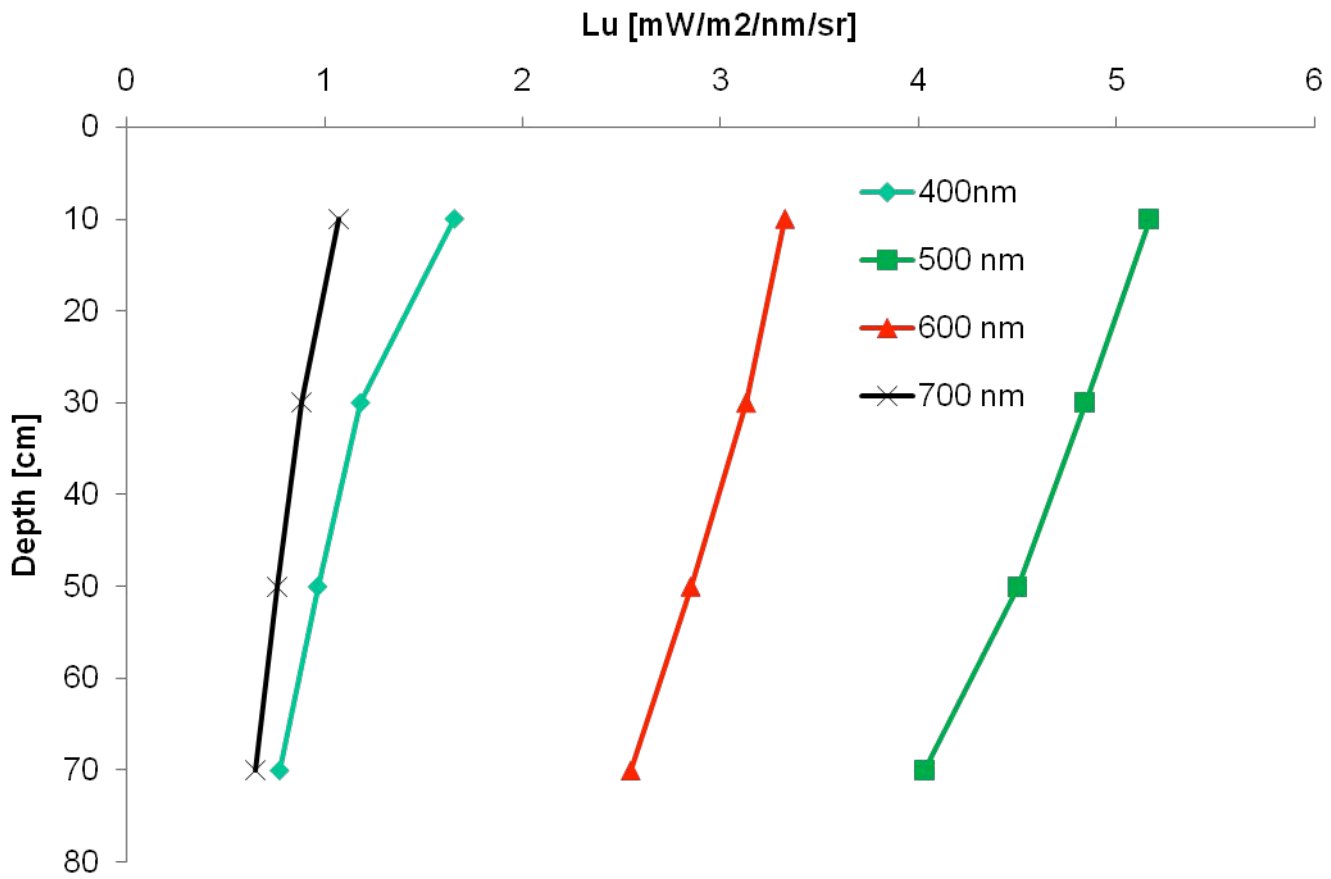
Floating system, Stockholm University

Bow mounted system, Tartu Observatory

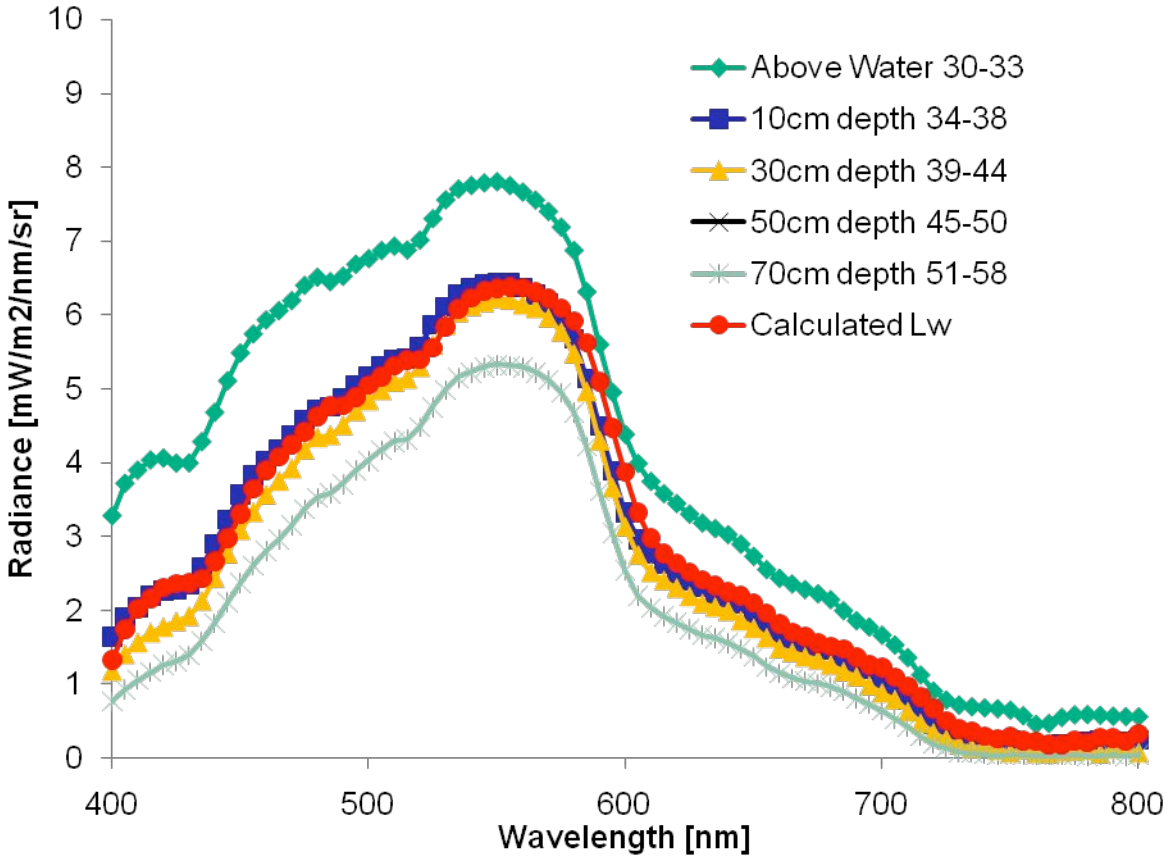
Broomstick profiling system, ARGANS/UoP

Photos by Gerald Moore

Calculating water-leaving radiance (preliminary results):

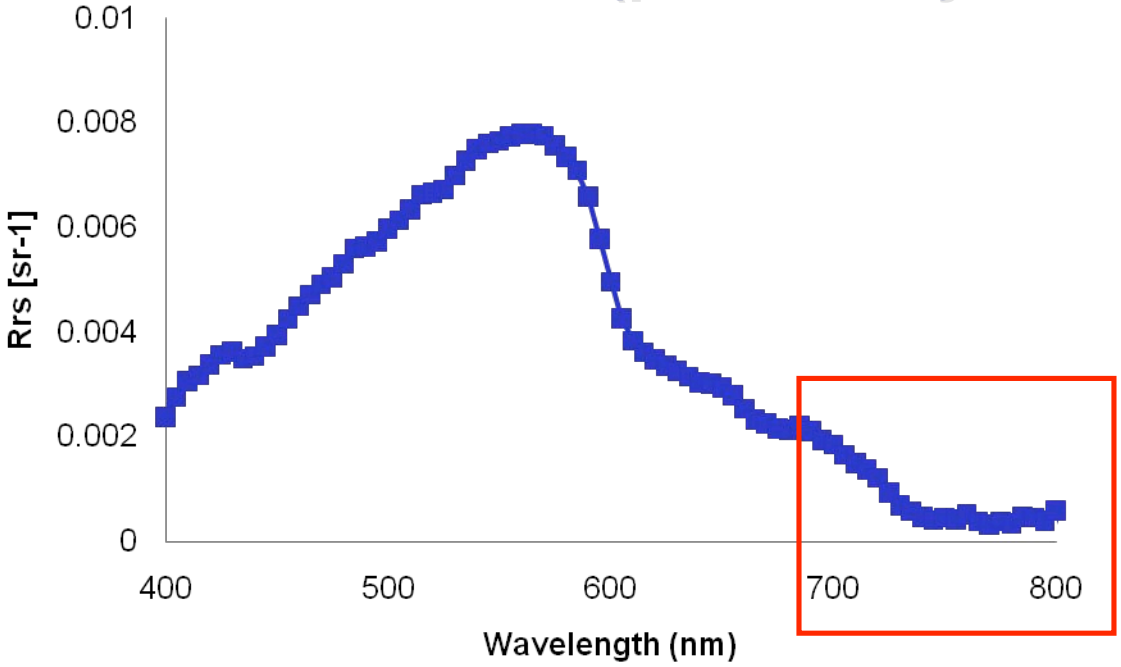


Calculating water-leaving radiance, Lw (preliminary results):



Corrections:
- Immersion factor (instrument is calibrated in air)
- Instrument self-shading

Conversion to reflectance, R [%] (preliminary results):



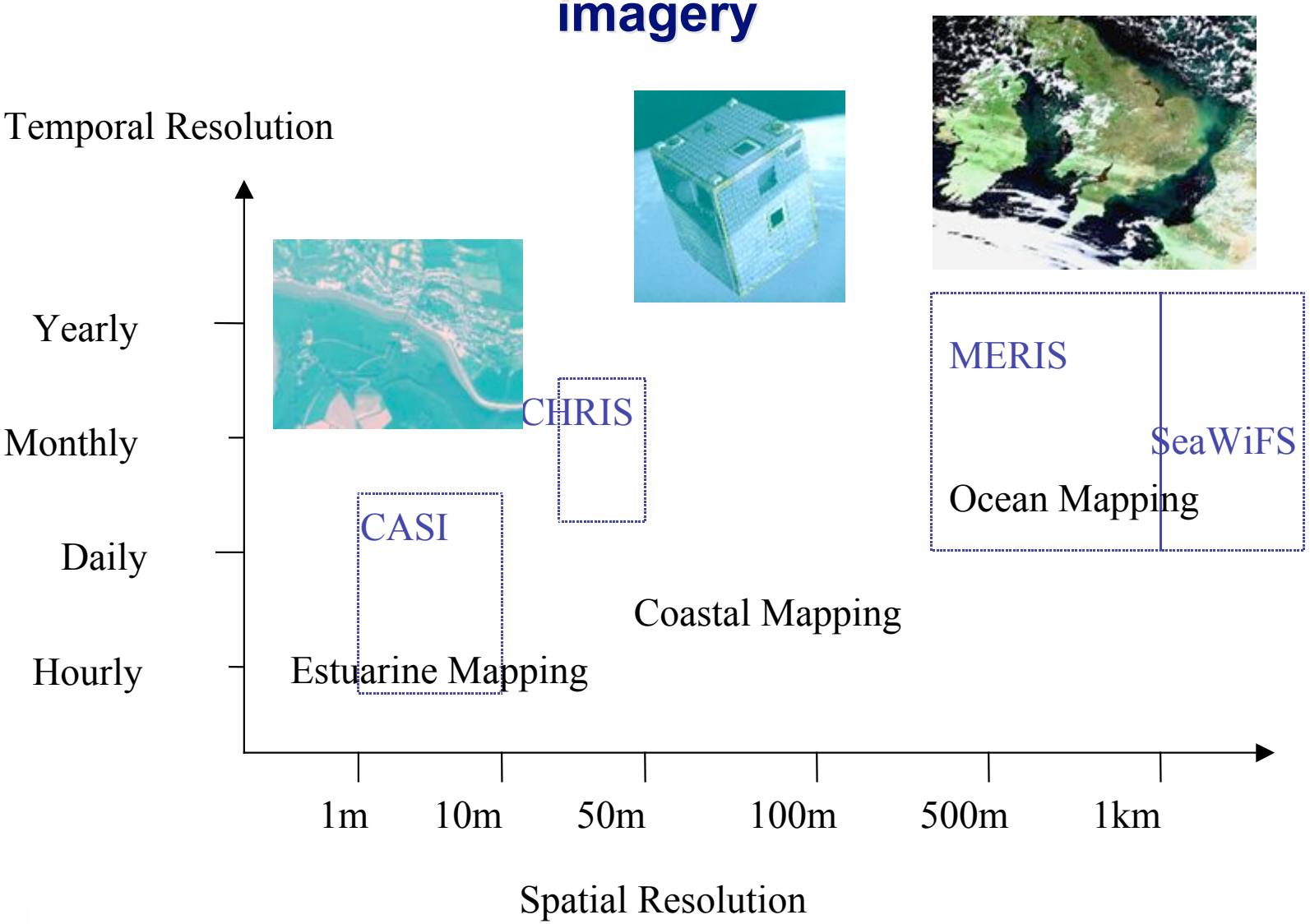
In this case downwelling contribution was measured using a Spectralon plaque and the Trios instrument.

Cannot assume zero for atmospheric correction

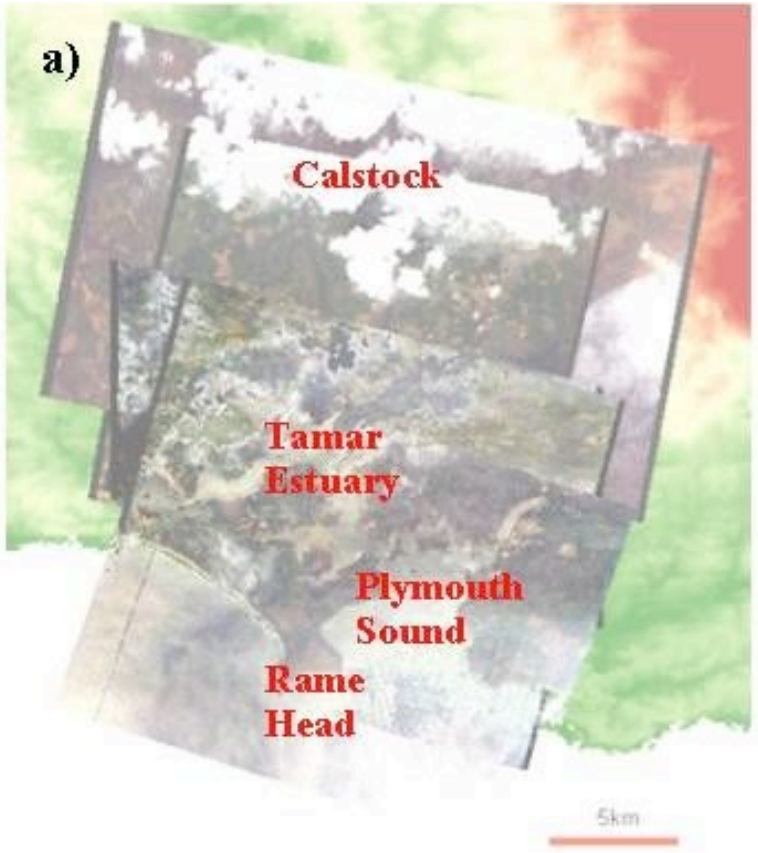
We can input this data into an IOP model to see what the concentrations of the optically active components might be….needs validation with bottle samples (no yet processed)

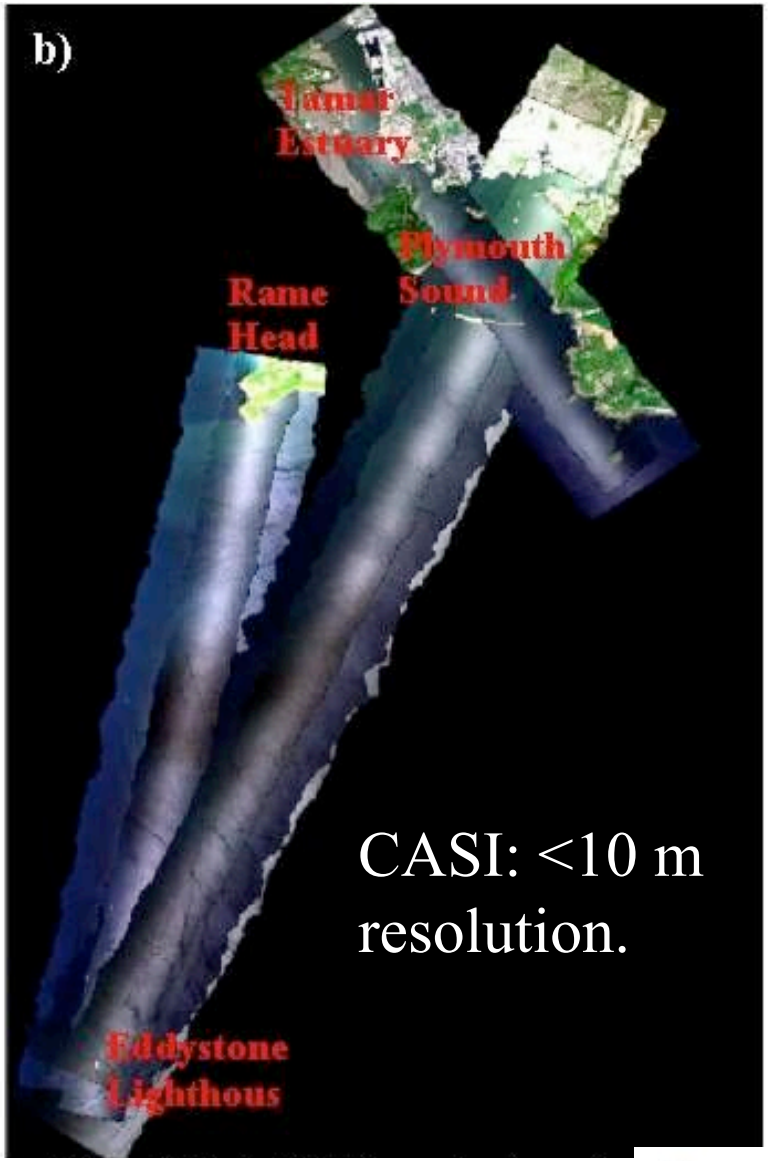
ARGANS

Choice of appropriate Earth Observation (EO) imagery



Plymouth Test Site





CHRIS-PROBA: approx 20m resolution and 5 look angles.

CASI: <10 m resolution.

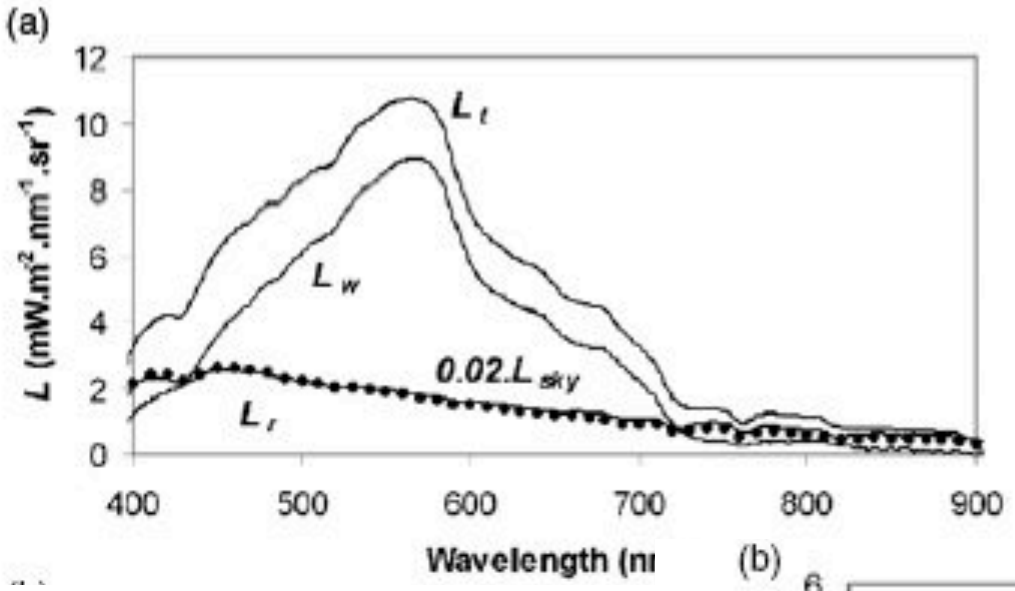
Water Sampling (Doxaran *et al.*, IJRS 2005, AO 2006)

SPM / TSM: Surface waters samples filtered (Whatman GF/F) and burned at 450°C for 4 hours; estimate of organic versus inorganic content. Two replicas were systematically made to estimate the TSM uncertainty (5%).

CDOM: Filtered (Whatman Anodisc filters), stored in a cool box and allowed to reach ambient temperature. Measured with UNICAM single beam spectrophotometer (5 cm path-length cuvette). Milli-Q water before and after to check lamp stability.

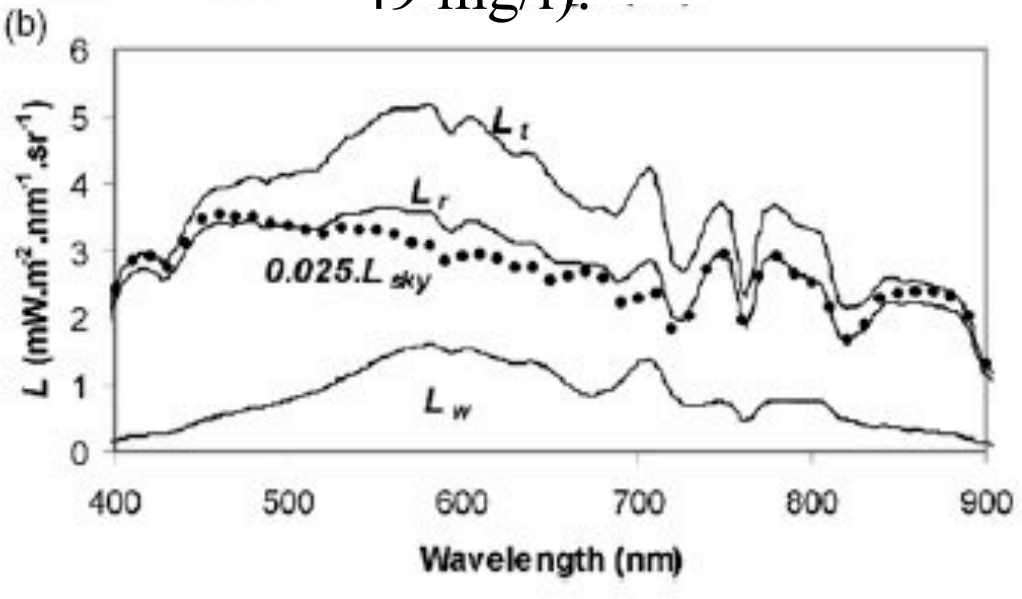
Chl: Filtered in the dark just after collection (Whatman GF/F filters) and kept in a freezer at -20°C for less than two weeks. Concentrations measured with Hitachi F-4500 fluorescence spectrophotometer.

Trios Measurements (Doxaran *et al.*, 2004 JOA)

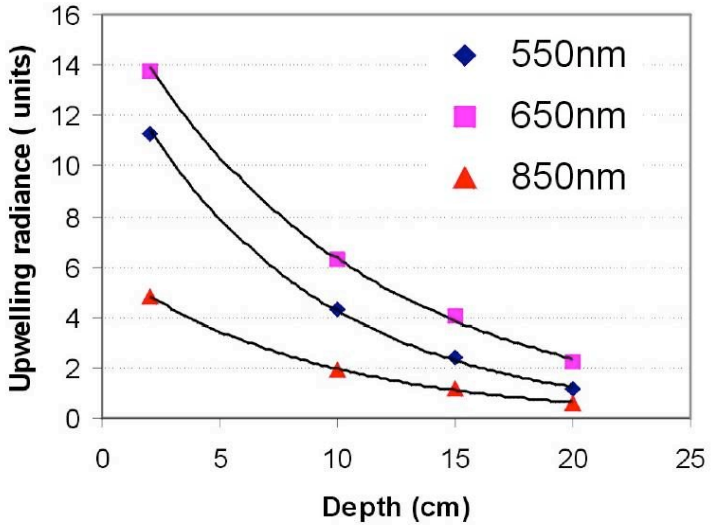


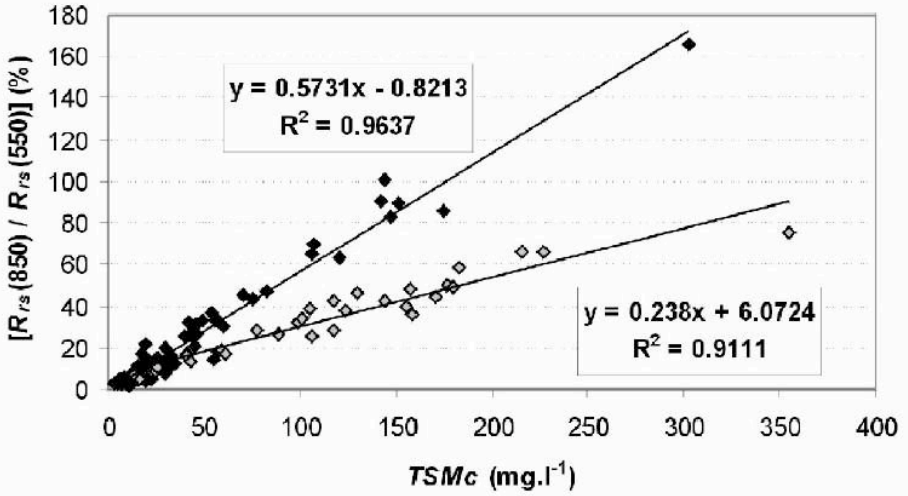
L_t and L_w radiance signals under (a) clear sky in the Plymouth Sound (TSM = 4 mg/l) and (b) covered sky in the Tamar estuary (TSM = 49 mg/l).

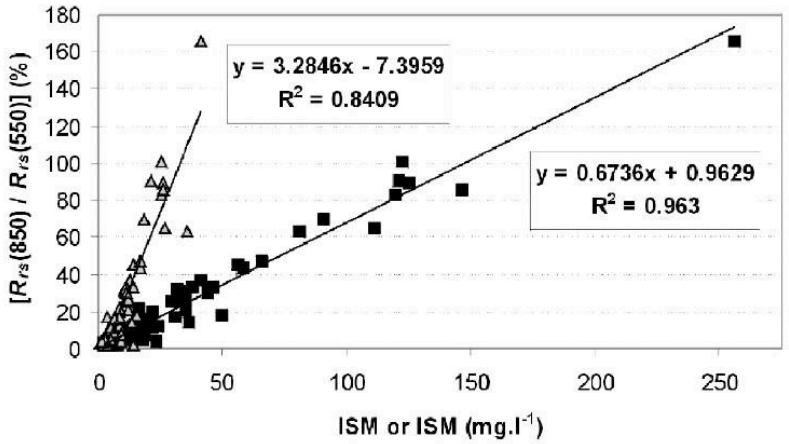
Percentage of the measured sky radiance (L_{sky}) reproducing the observed L_r signal.

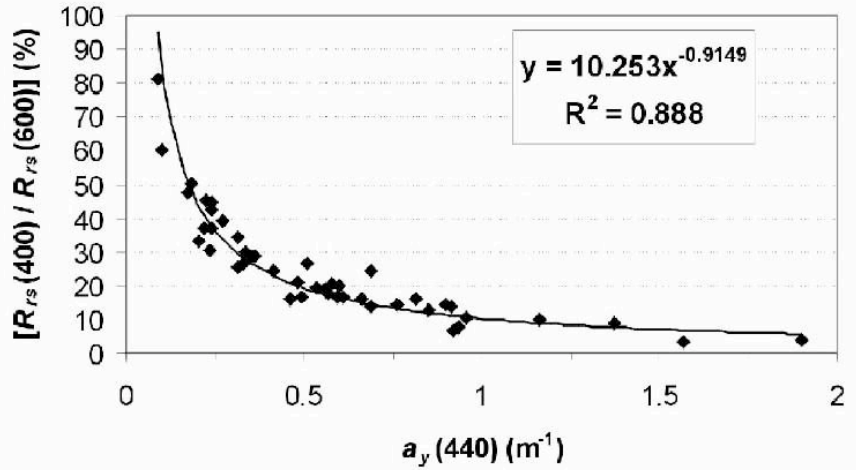


Development of robust algorithms (Doxaran *et al.*, 2006)



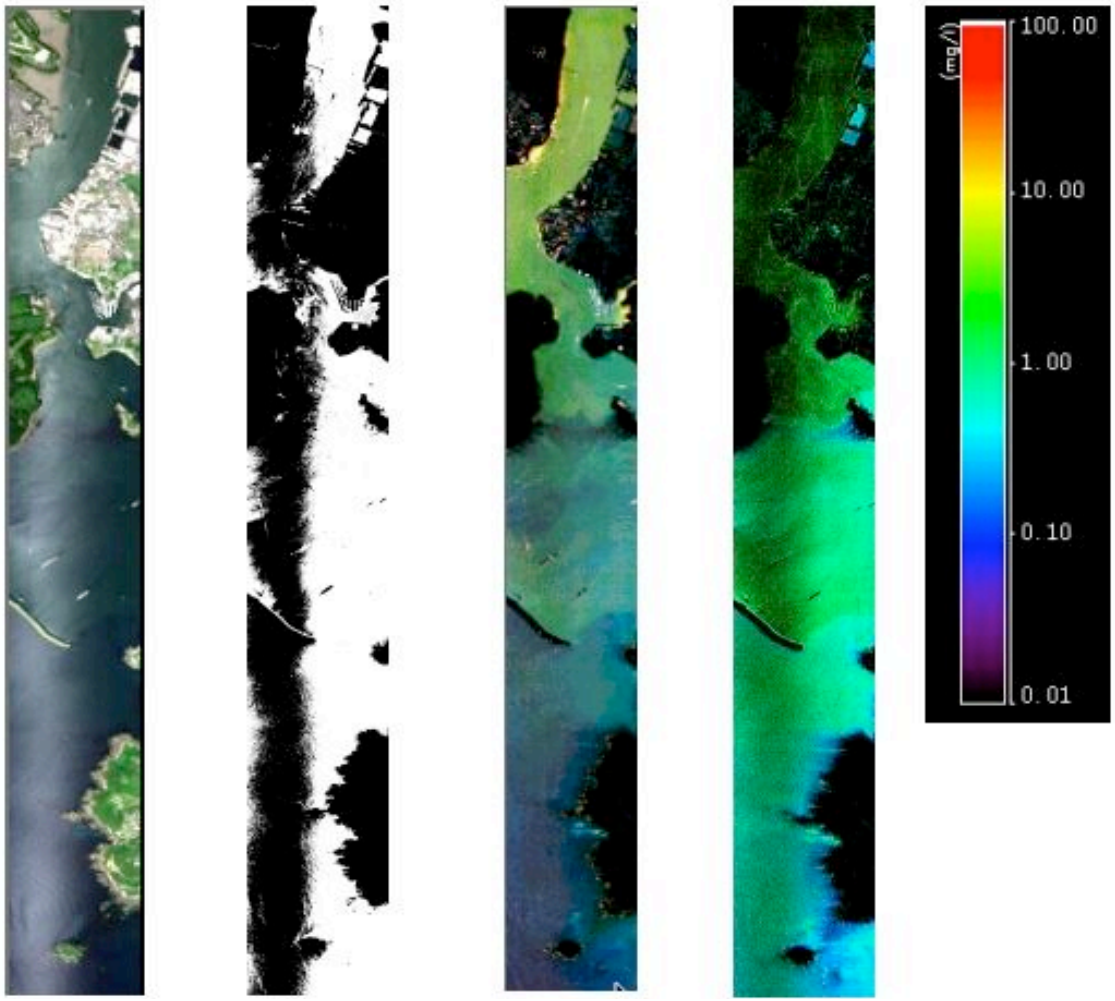






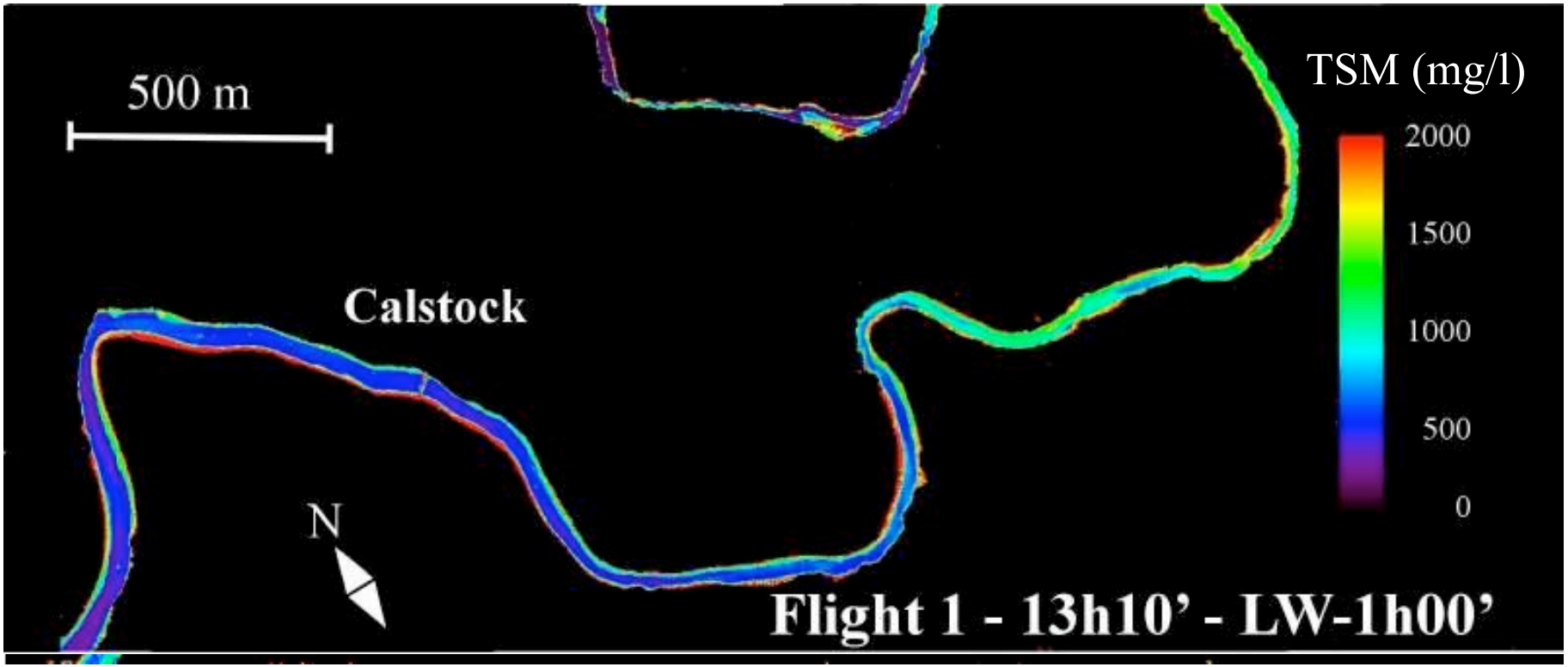
Black (Tamar) and Grey (Gironde)

CASI imagery, 13 June 2003.

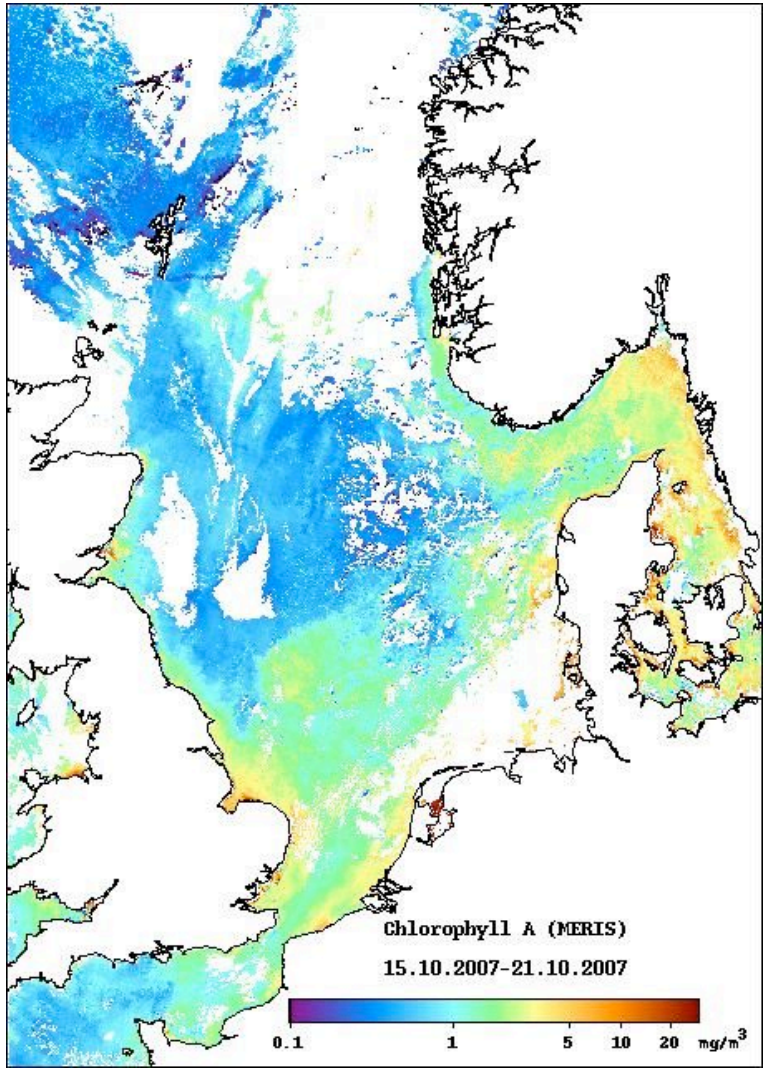


Uncorrected image, non-water mask, corrected image and SPM map.

Mapping the turbidity maximum (Doxaran *et al.*, NERC EO Conference)



MARCOAST Near-Real Time Service



MarCoast is a three year GMES (Global Monitoring for Environment and Security) project funded by the European Space Agency.

See http://www.gmes-marcoast.com/ for further details

Summary: some issues to consider

- Processing of *in situ* radiance data: need to fully normalise the same as the satellite data; currently based on f/Q look-up table, but needs further measurements/modelling in coastal waters and NIR
- Spatial homogeneity within the satellite pixel and movement of the water e.g. how close to the satellite overpass time does my *in situ* measurement need to be?
- Land adjacency affects: BEAM now includes the ICOL processor for MERIS – to be run on the Level1 data
- Atmospheric correction: needs to take into account the near infra-red water-leaving radiance. May also have absorbing aerosols and high concentrations of gases such as ozone.
- Application of algorithms/models. Are they suitable for my study area? Do I have suitable/enough *in situ* data to validate the results?

Acknowledgements

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Researchers:
- Dr Nagur Cherukuru (now at CSIRO, Australia)
- Dr David Doxaran (now at Laboratoire d'Océanographie de Villefrance, France)
- Dr Yaswant Pradhan (now at Met Office, UK).