

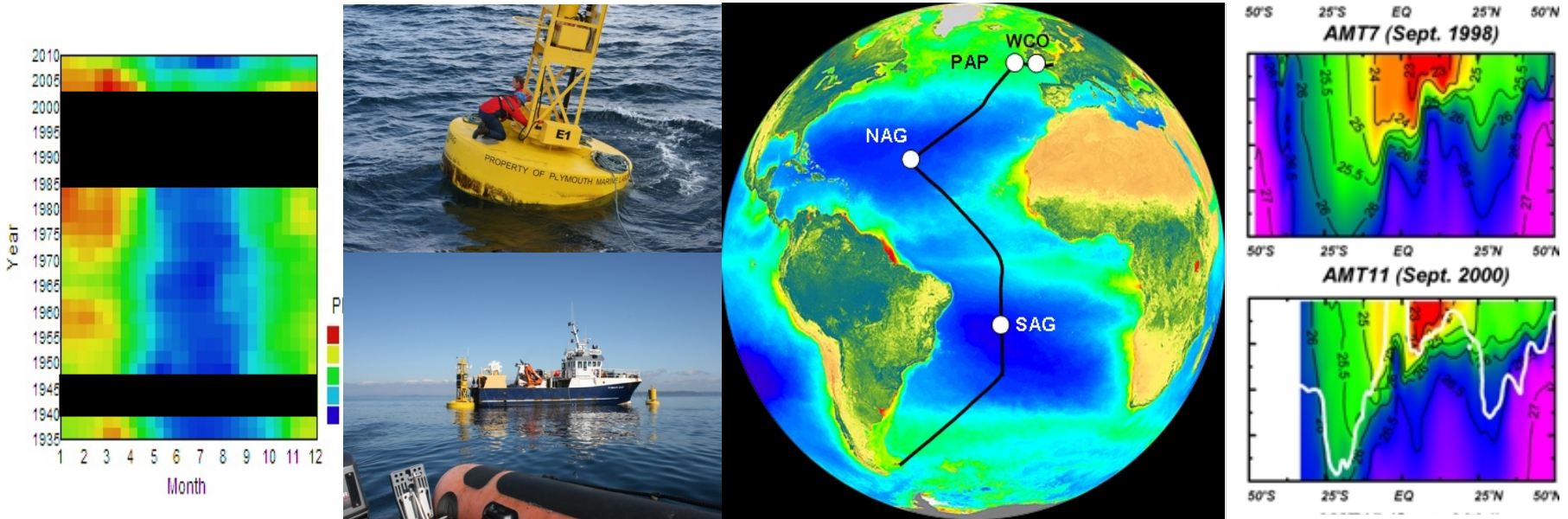
PML

Plymouth Marine
Laboratory

Listen to the ocean

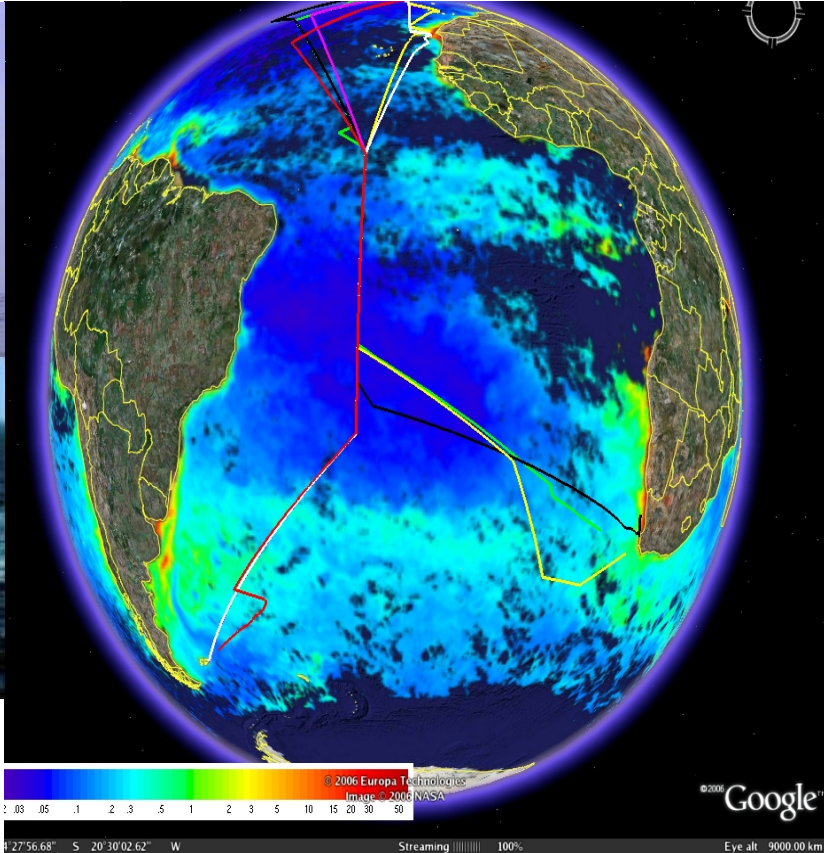
The observational platforms of PML for air-sea exchange: AMT & WCO

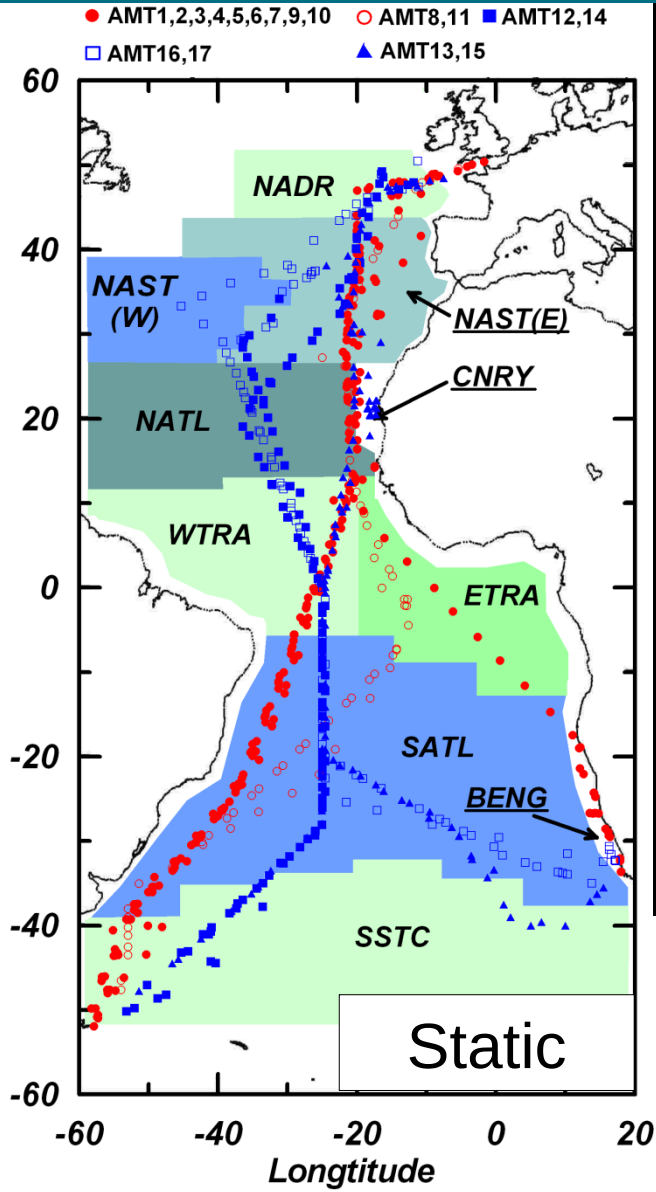
Tim Smyth, PML



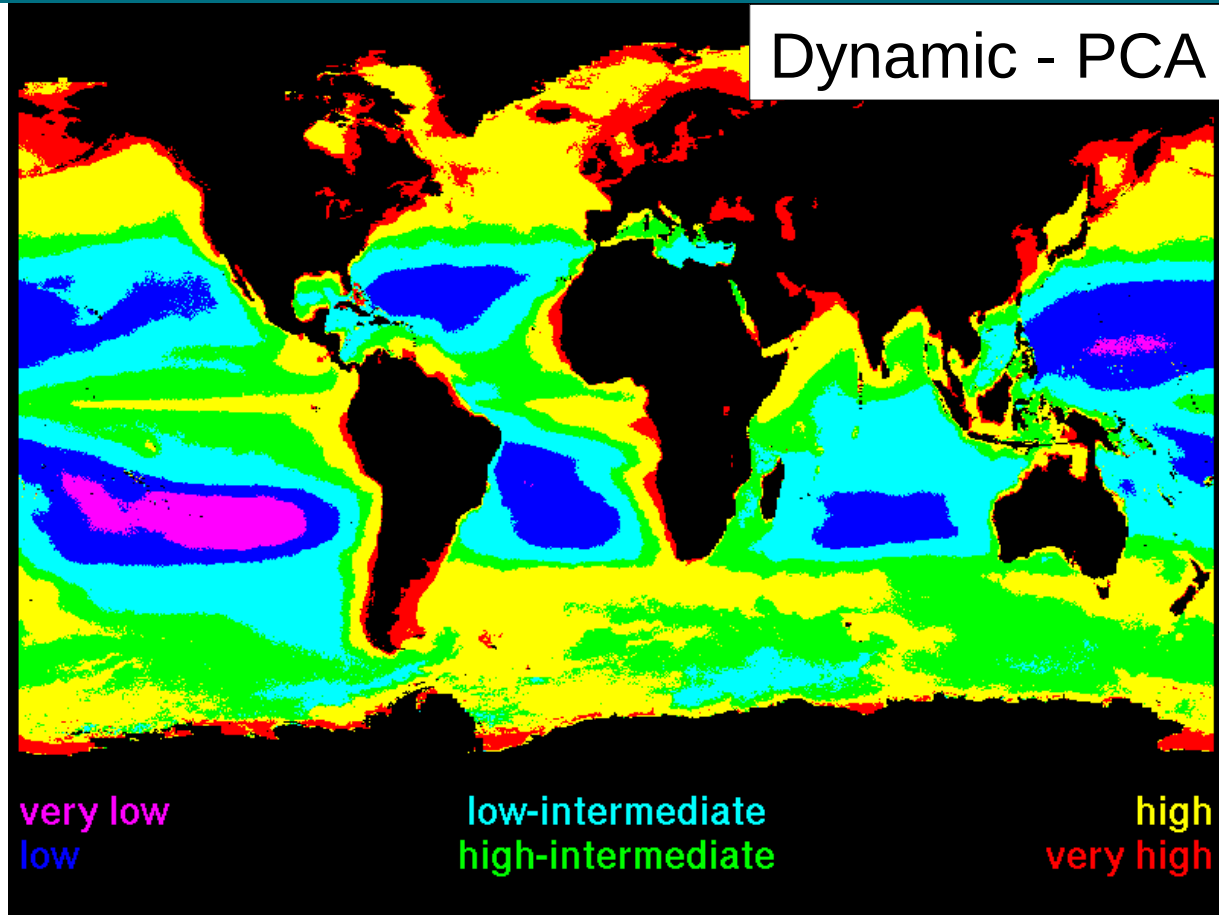
PML's observational platforms (AMT)

- **AMT** is an Atlantic Transect that runs from 50 N – 50 S
 - When: 1995 – present
 - Coherent set of repeated biogeochemical measurements
 - low temporal frequency, extensive spatial coverage, decadal time period.





Longhurst et al. (1995)



Hardman-Mountford et al. (2009)

Unique Selling Point:
 Samples across contrasting provinces
 / biomes

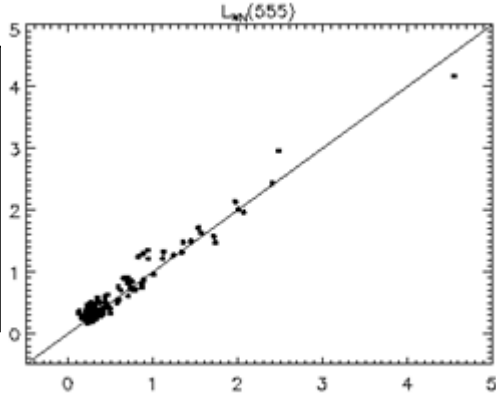
AMT – potted history

- Distinct phases
 - AMT 1 – 11: PML led with strong emphasis on satellite cal/val;
 - AMT 12 – 17: NERC consortium;
 - AMT 18 – present: NERC Oceans 2025, National Capability.
- Satellite:
 - Primary (radiometric) and secondary (product) validation
- Air-sea exchange:
 - Physics (heat, momentum)
 - Chemistry (gases, aerosols)
 - Bio-geochemical interactions (DMS, OVOCs, UV)

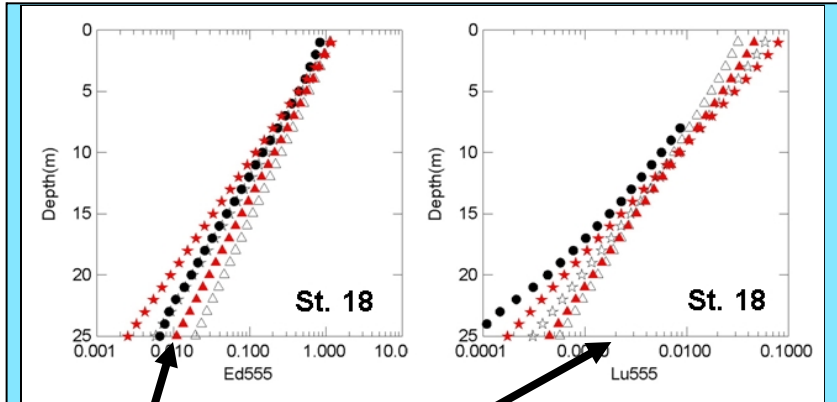
Satellite

- Primarily in collaboration with NASA
 - Prior to and shortly after SeaWiFS launch (1995 – 2000)

Satellite

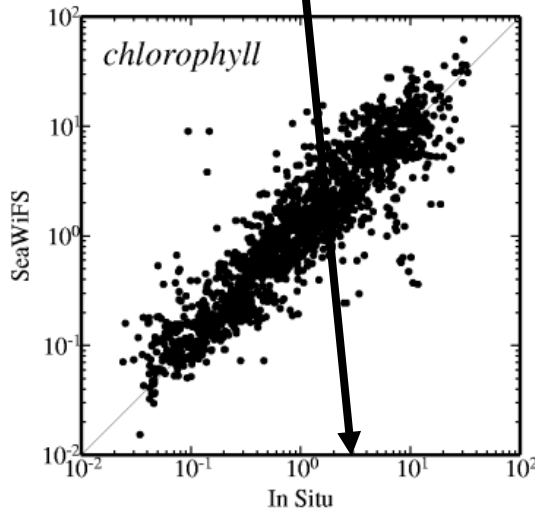
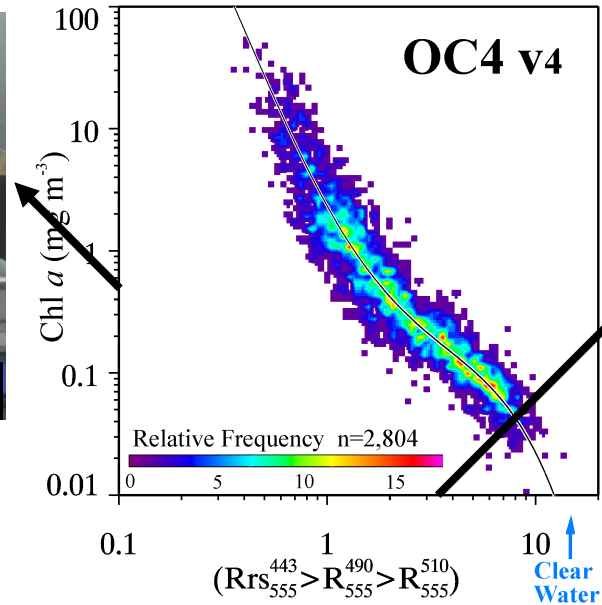


In situ



Satellite

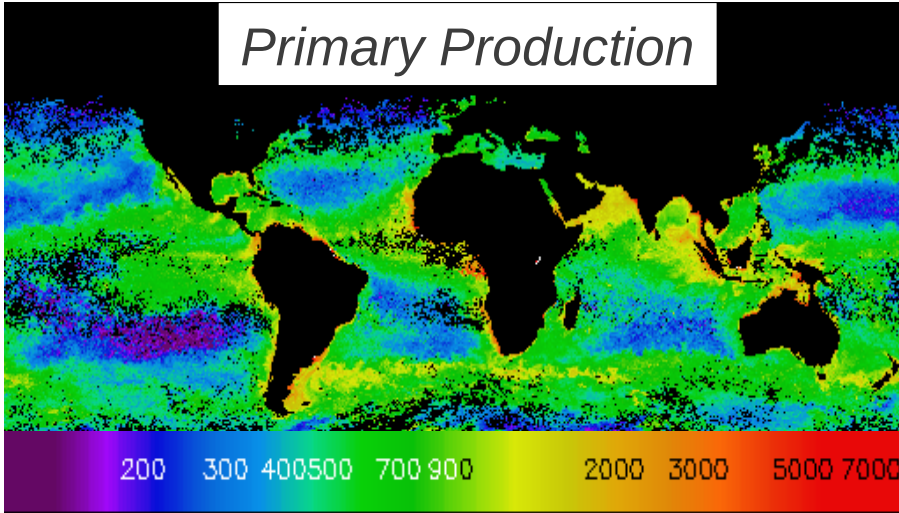
Product development / validation - chlorophyll



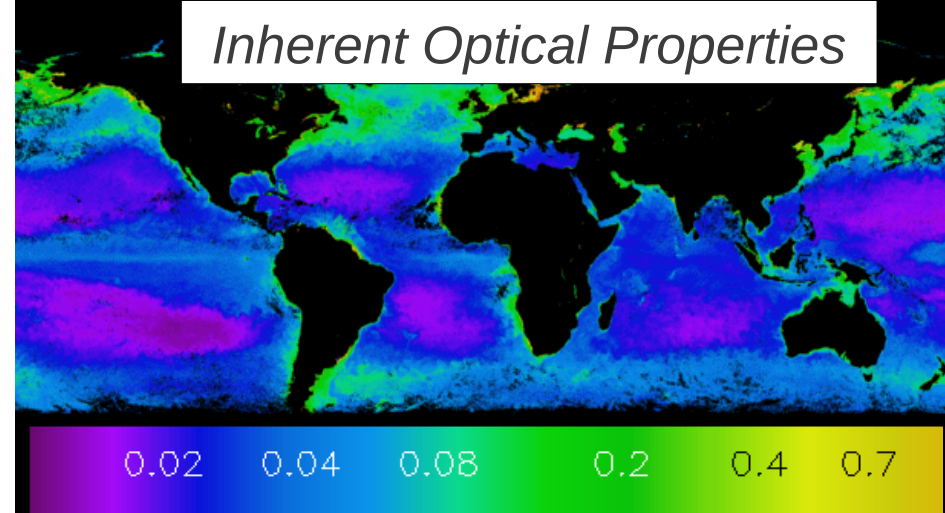
Satellite

- Key dataset for global algorithm development:

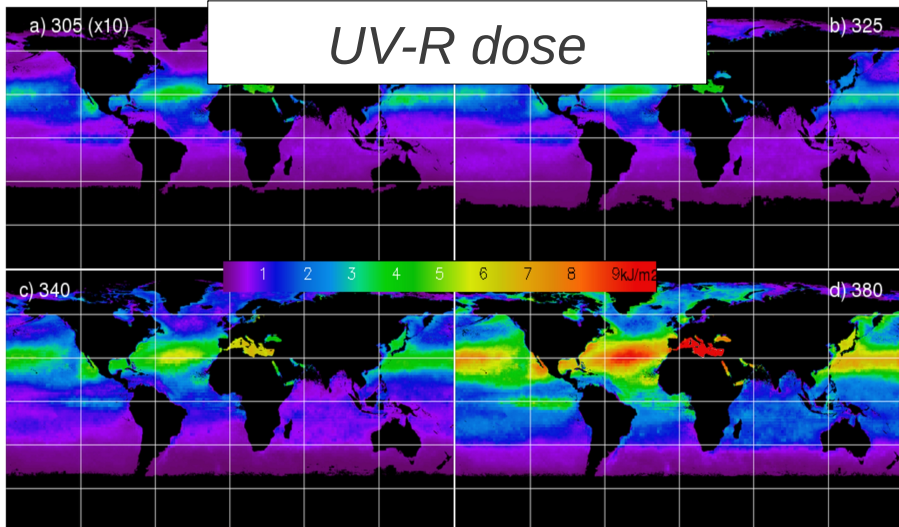
Primary Production



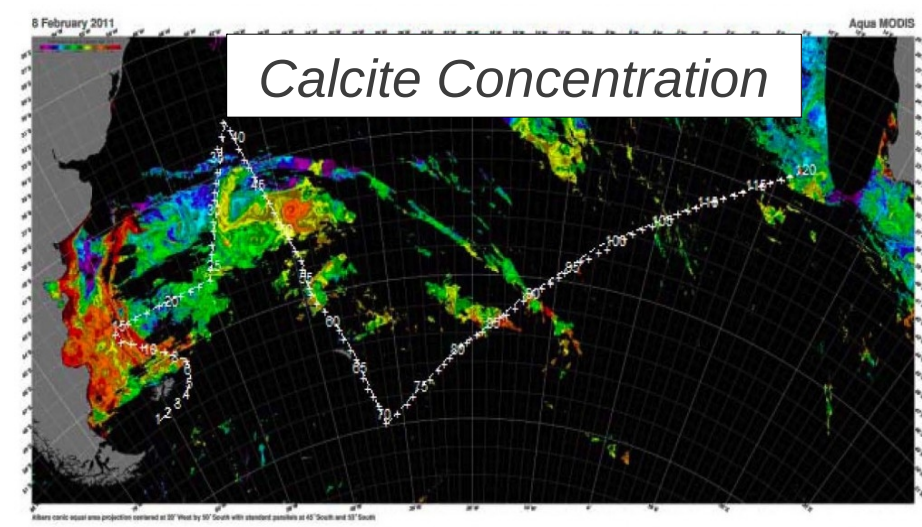
Inherent Optical Properties



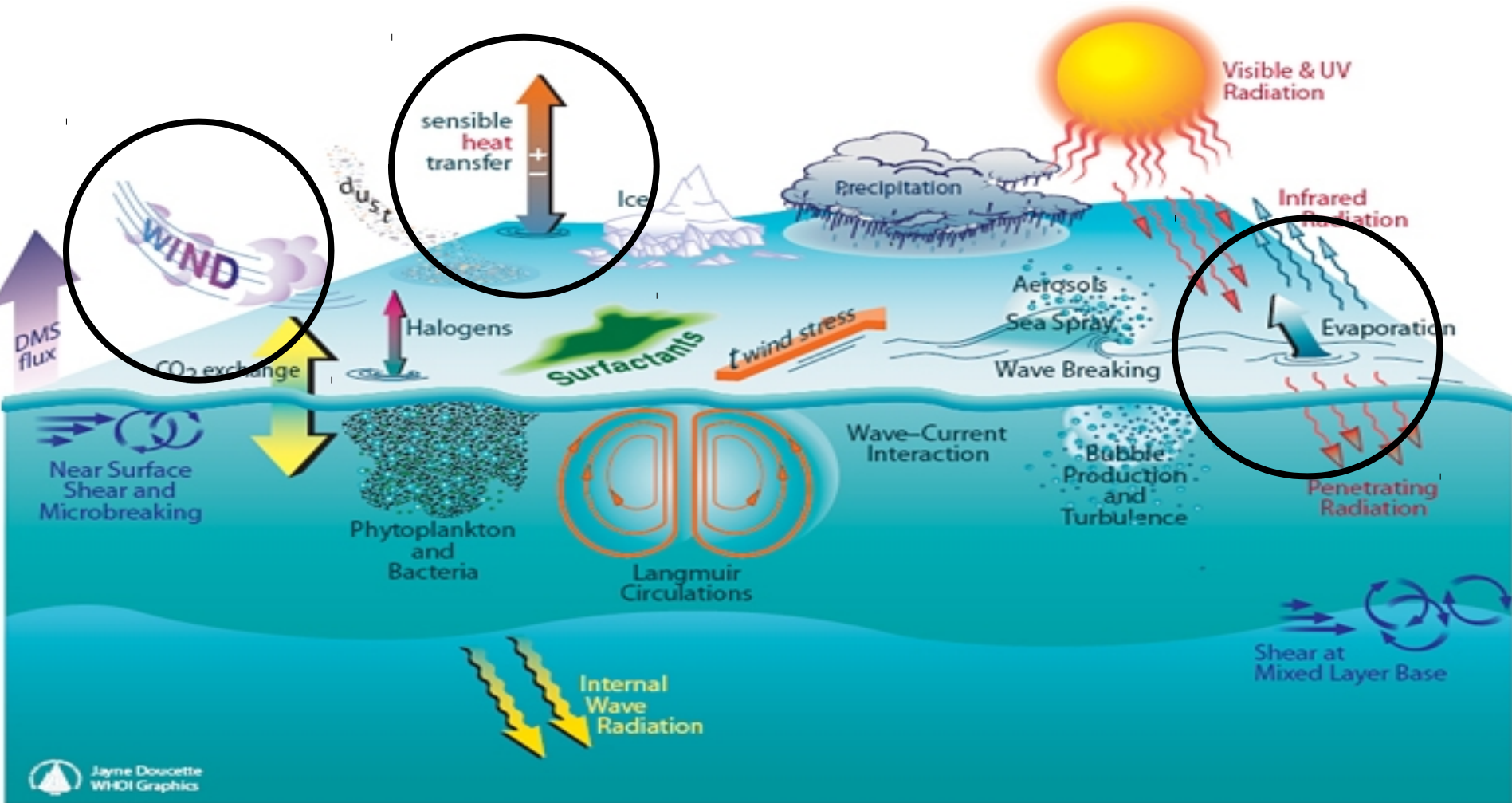
UV-R dose



Calcite Concentration

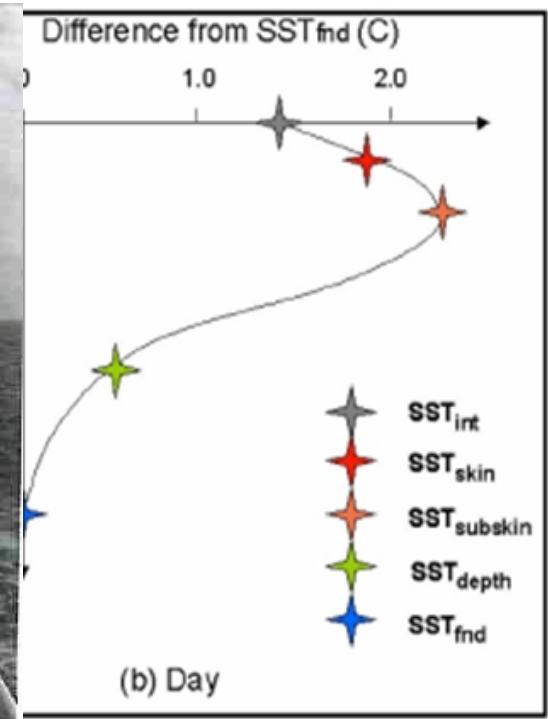
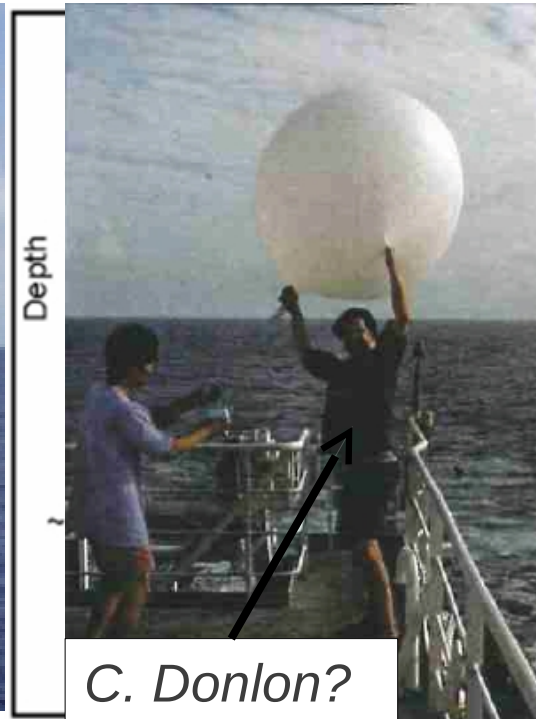
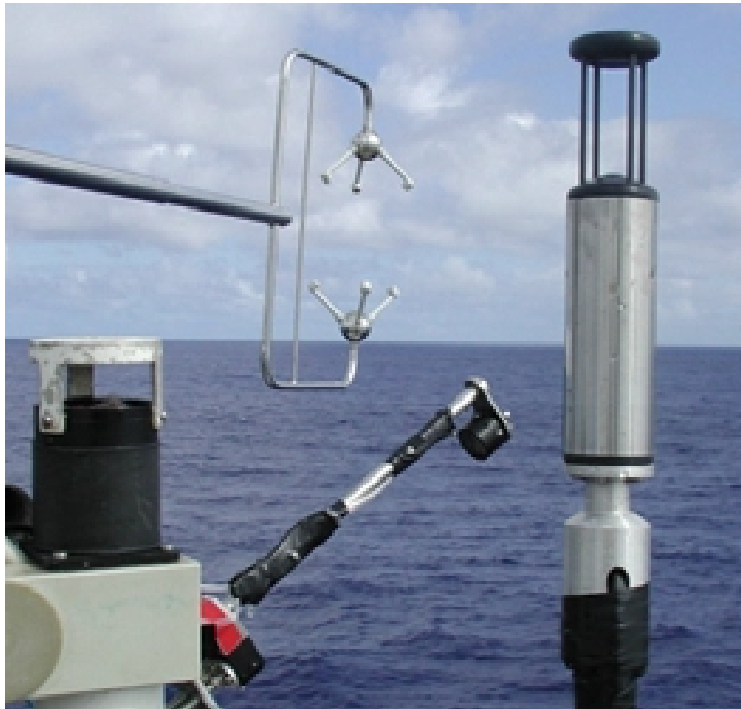


Air-sea exchange

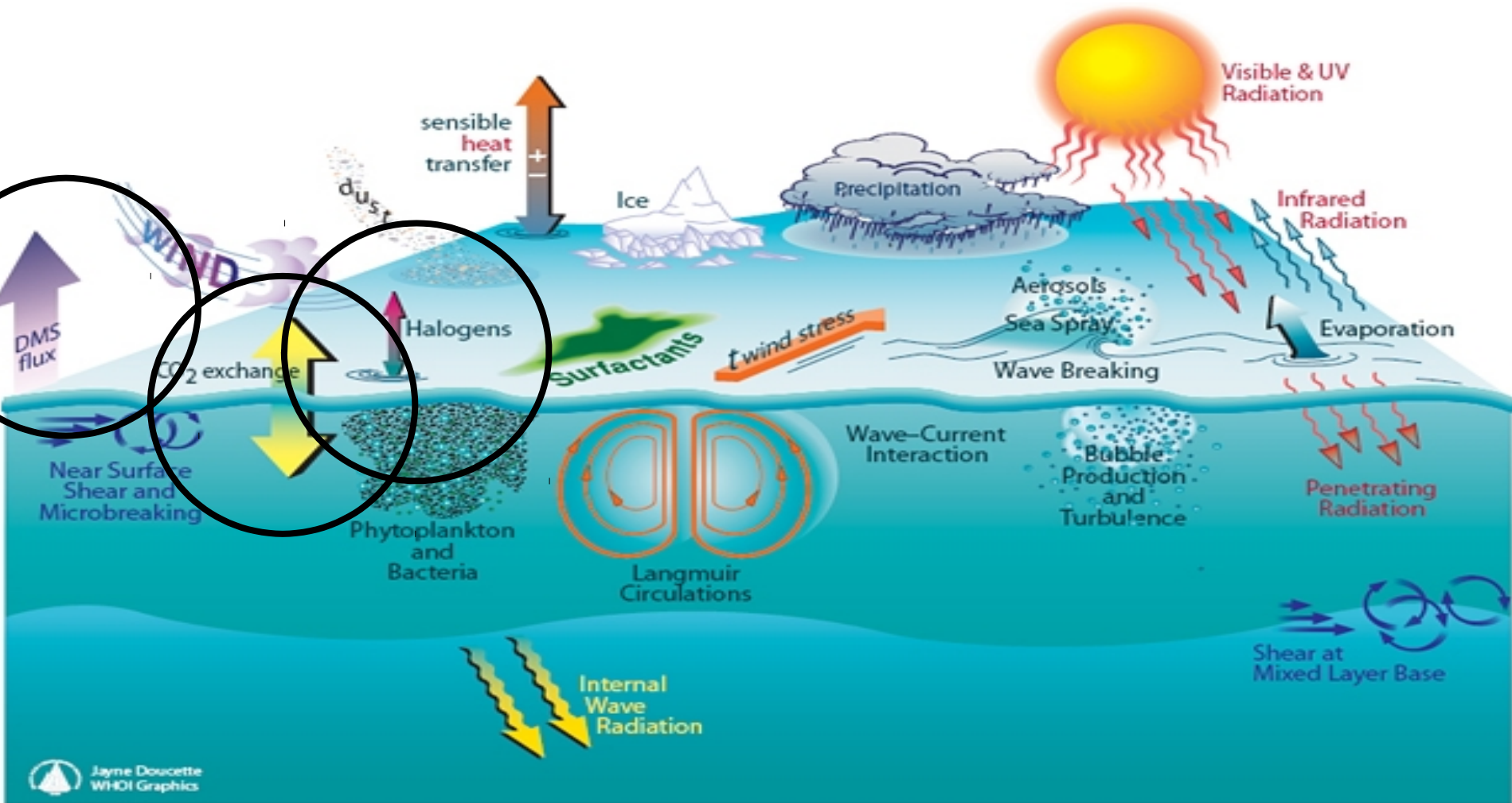


Air-sea exchange

- Understanding the air-sea interface:
 - ROSSA: Skin temperature; bulk temperature; satellite validation and technological development (JRC, AMT 3,5,7)
 - AutoFlux: Sensible, latent heat; momentum and CO₂ (SOC, AMT 11)



Air-sea exchange



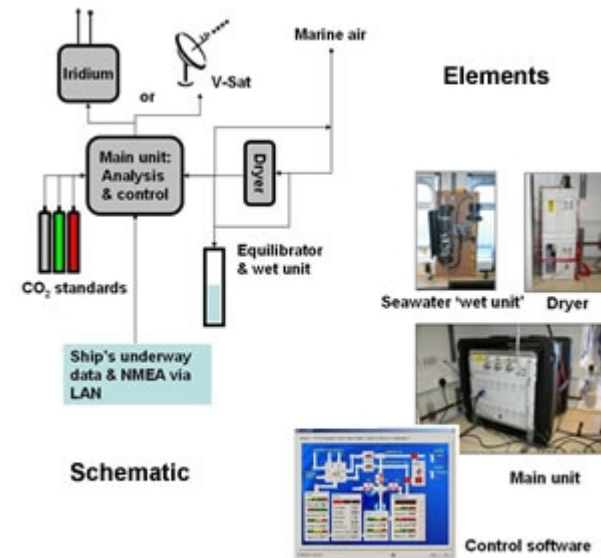
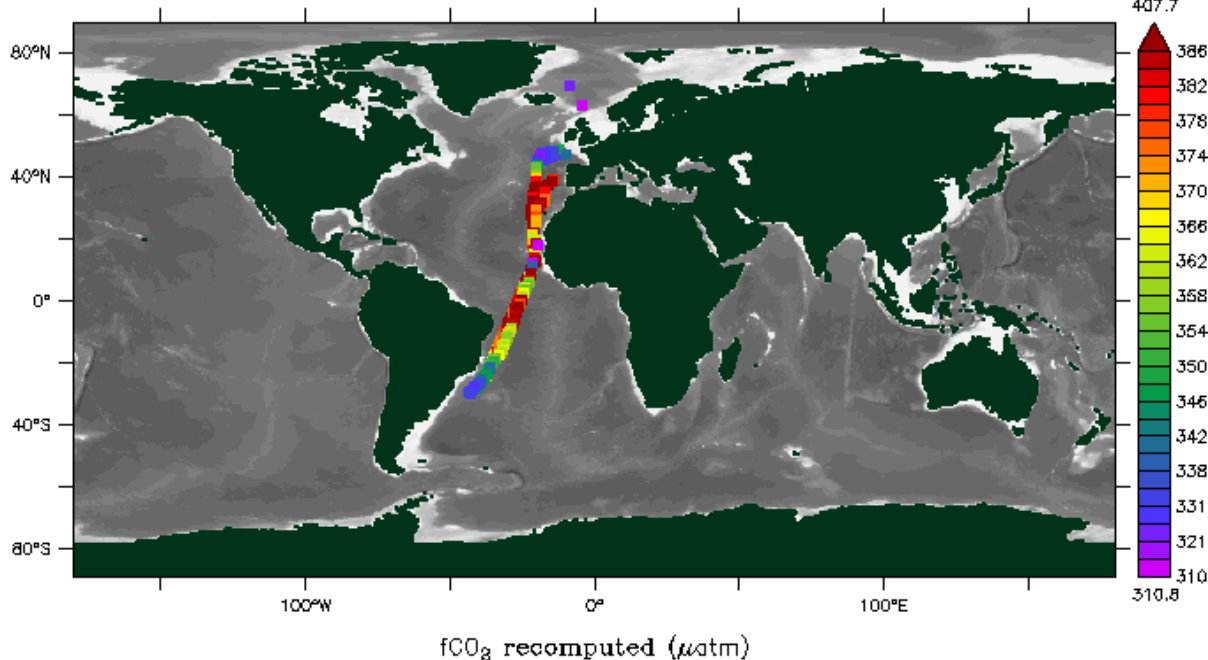
Air-sea exchange

- DMS flux (Bell: AMT 12 – 14);
- pCO₂ (various systems, UEA, PML)
- OVOCs (Beale, Dixon: AMT 19; Yang: AMT22)

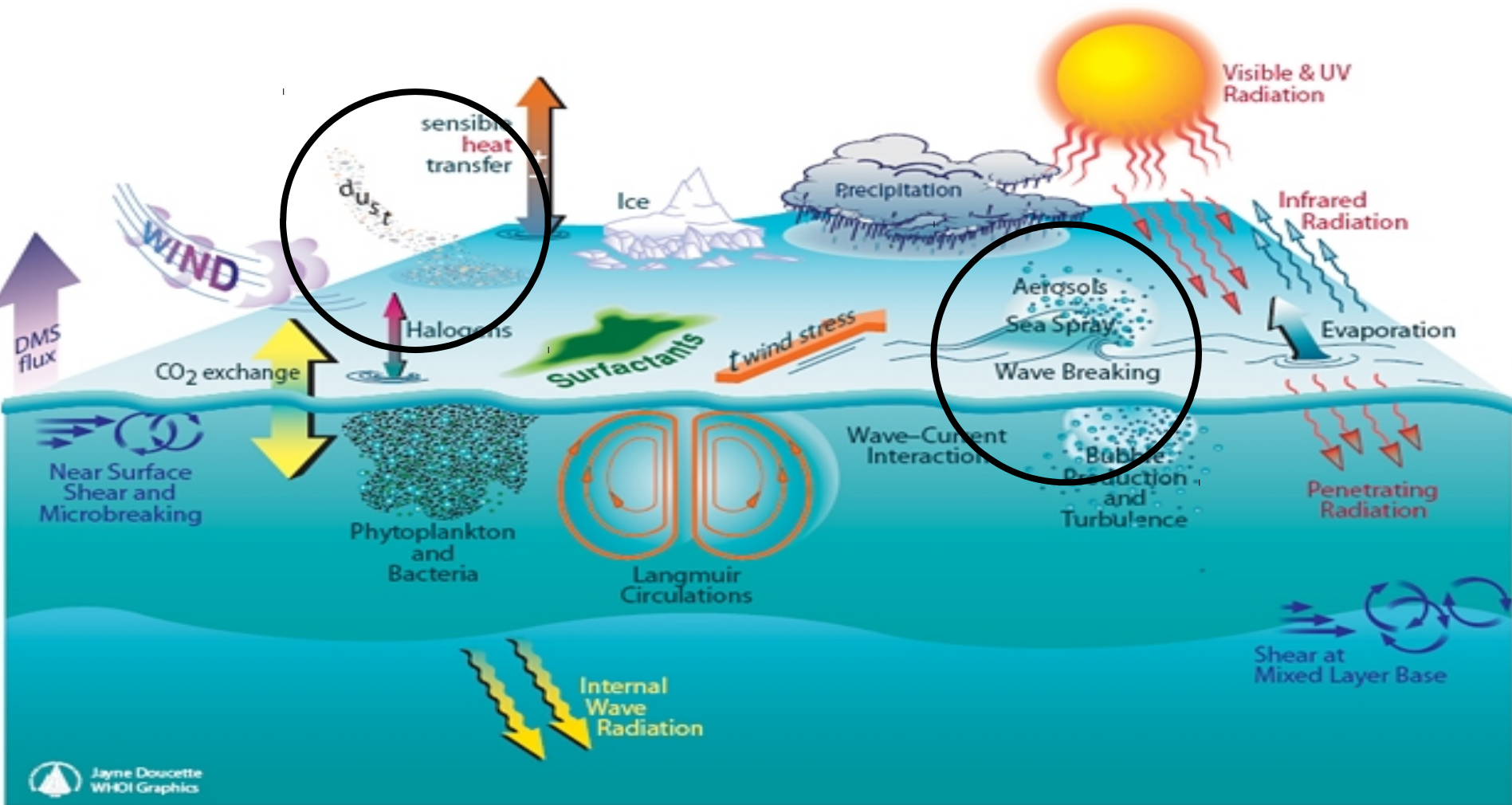
Surface Ocean Carbon Atlas -- Version 2

16-Nov-1988 to 26-Dec-2011

5 cruises
sample of 226 (0 missing)
sampled from 2135 total obs
407.7

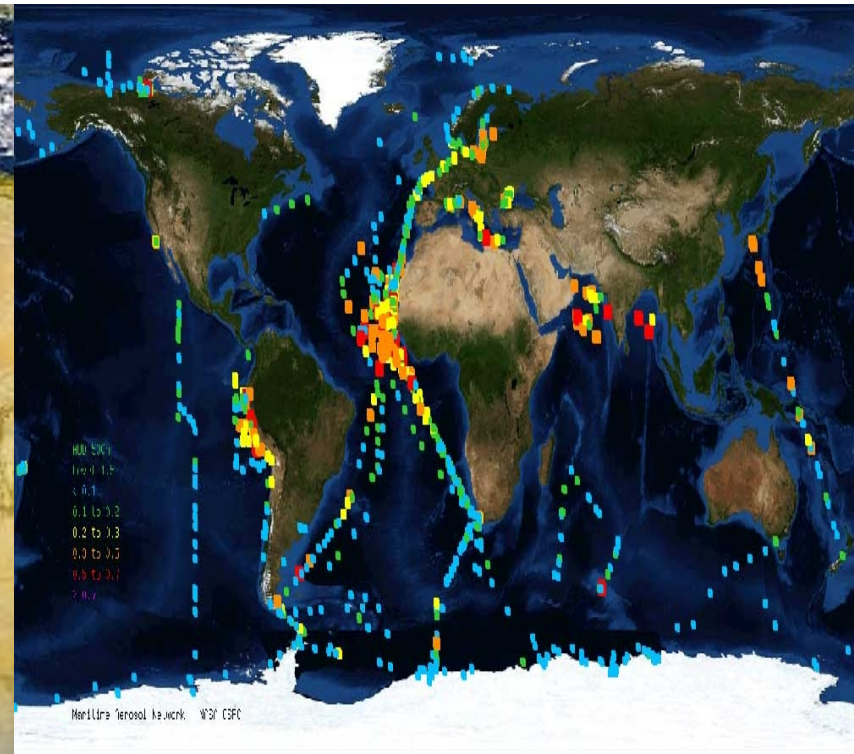


Air-sea exchange



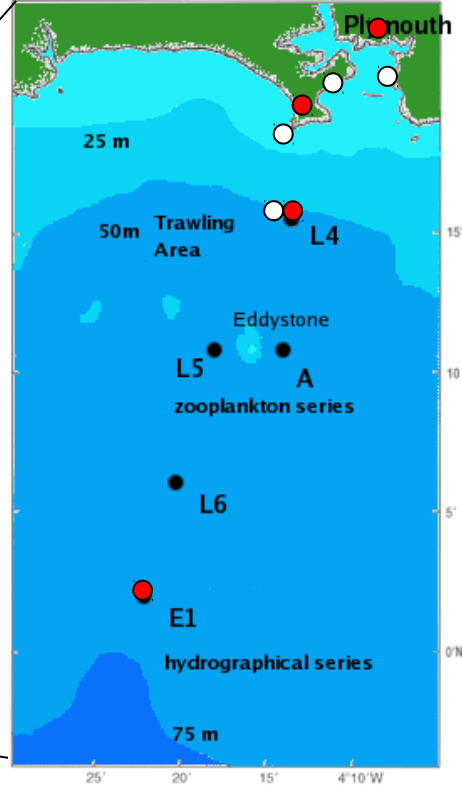
Air-sea exchange

- Dust deposition (wet, dry)
- Aerosol optical properties (NASA: AMT 18 -)
 - Marine component of the AERONET database

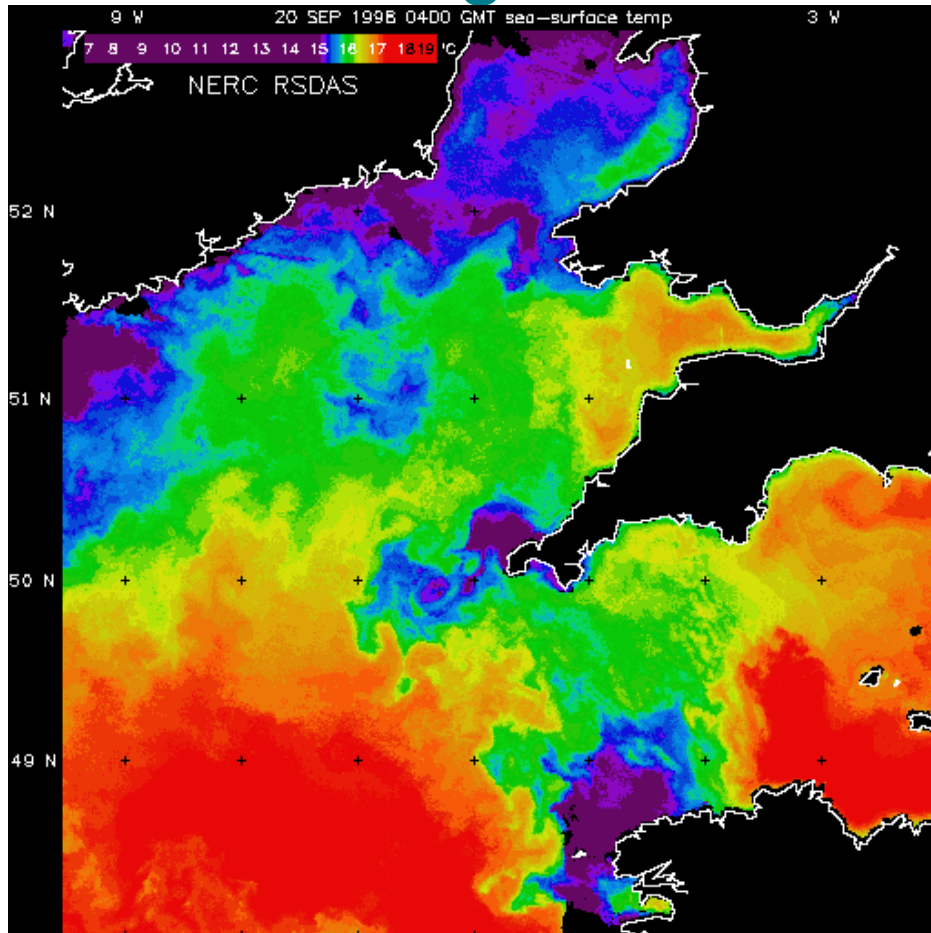


PML's observational platforms (WCO):

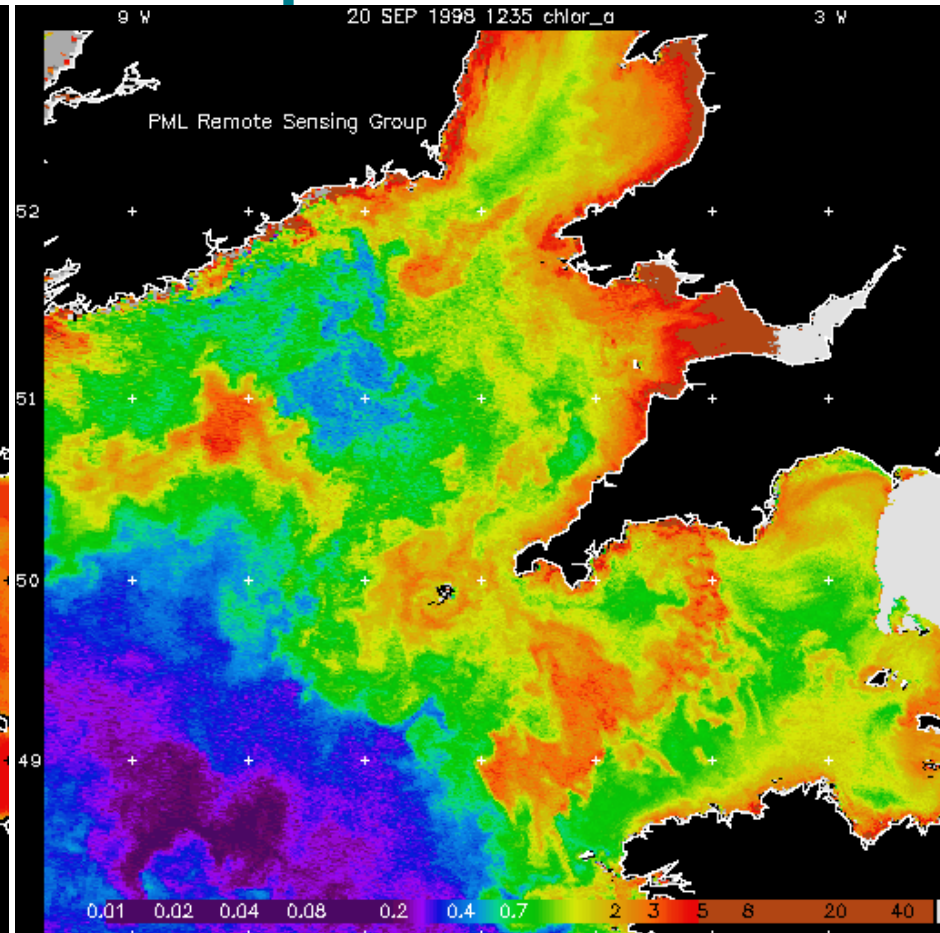
- **WCO** is a set of long-term time-series stations in the western English Channel
 - When: 1903 – present
 - Coherent set of repeated biogeochemical measurements
 - high temporal frequency, low spatial coverage, centennial time period.



Western English Channel: wider picture



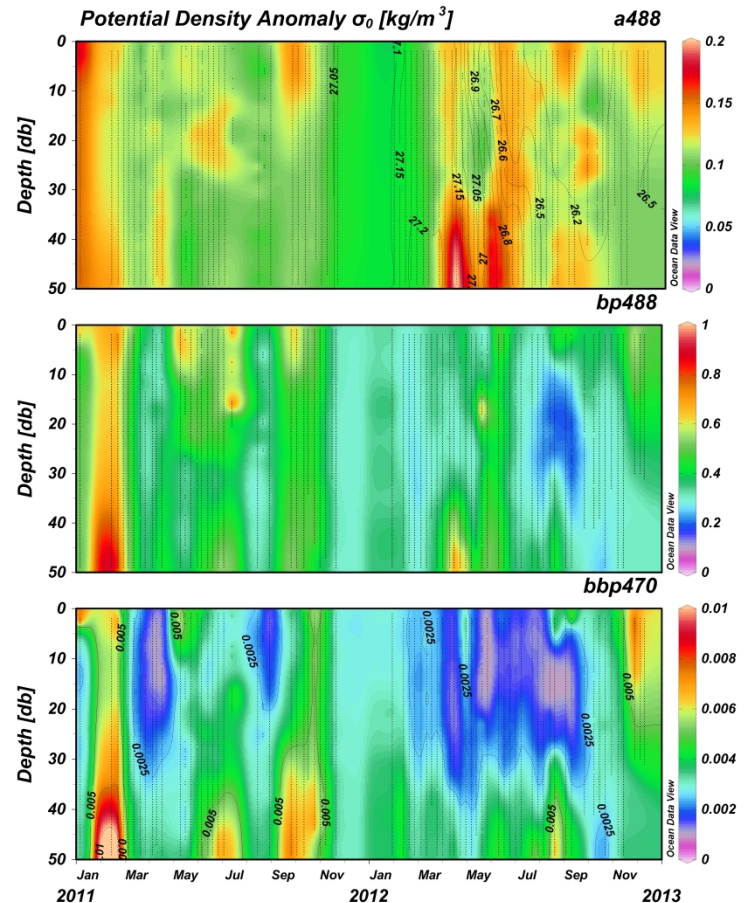
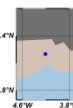
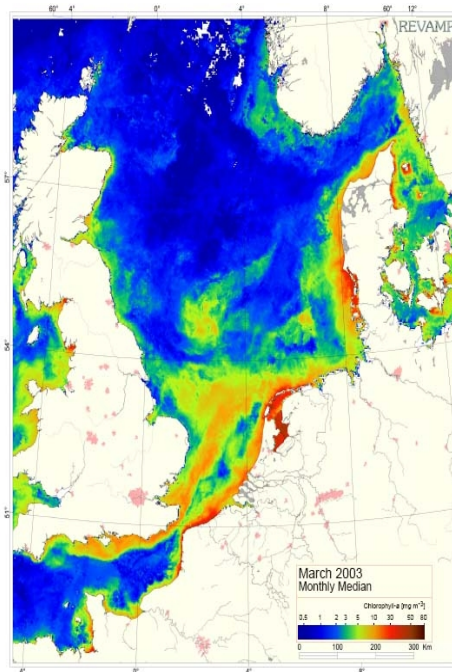
AVHRR SST 20/09/1998



SeaWiFS Chlorophyll 20/09/1998

Satellite validation

- Similar to AMT – but with a coastal waters emphasis;
 - Coastloc (1996 – 1999); Revamp (2001 – 2004); COASTCOLOUR (2009 – 2012)

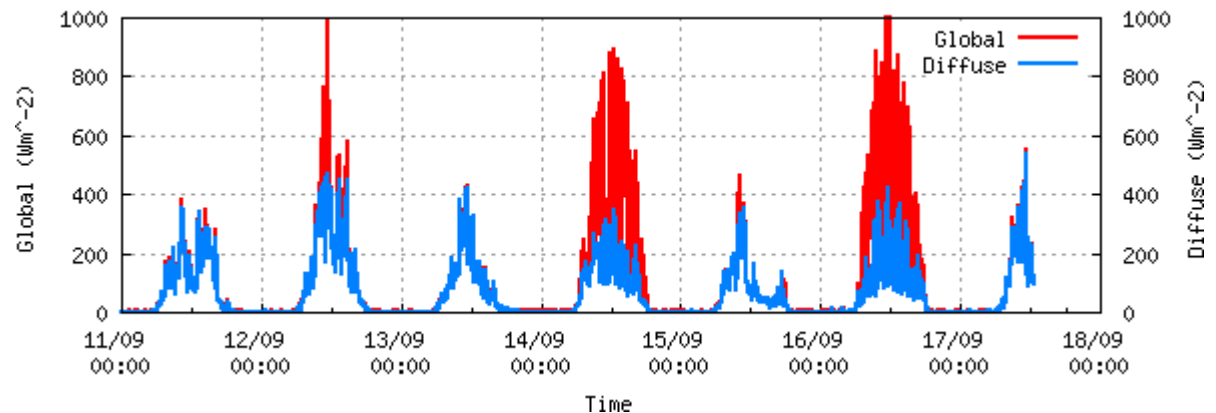


Moored platforms

- Platforms of opportunity: instrument development / deployment



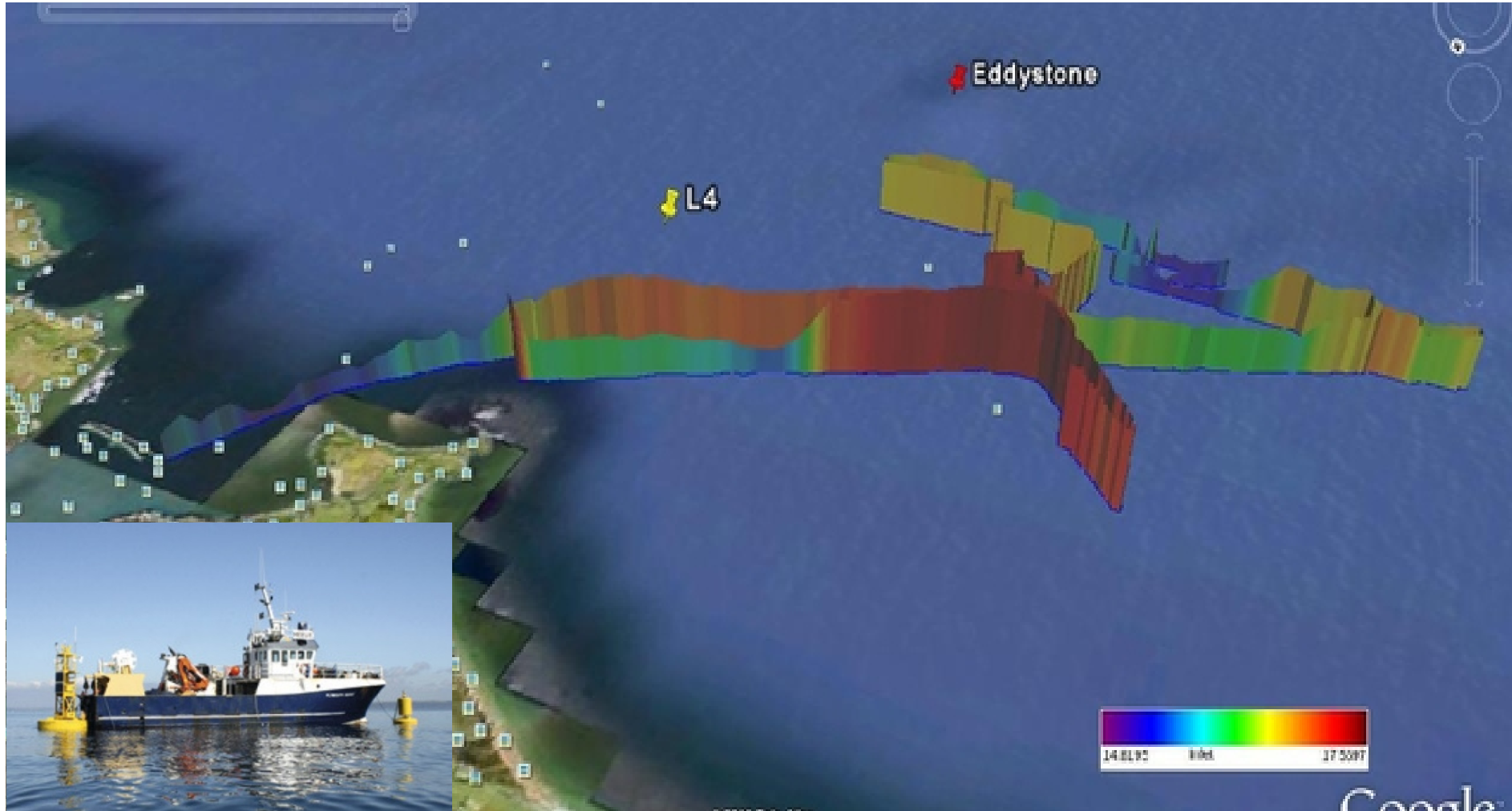
L4 Buoy SPN1 data - past 7 days



- Heat, momentum & gas flux?
- Whitecaps?

Underway systems

- RV Quest: Major RV grade underway system
 - Standard measurements + pCO₂



PML Plymouth Marine Observatory New developments: Atmospheric Chemistry Observatory



Use of Trinity House building

- ✓ At sea level: Eddy-covariance possible
- ✓ Clear sight of L4 (E1)
- ✓ Joined up atmospheric / marine research
- ✓ Aerosols; ship pollution
- ✓ Ease of access
- ✓ Electricity supply
- ✓ Line of sight WiFi - PML



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Image © 2013 Getmapping

Imagery Date: 4/5/2007 50°17'47.03" N

Thank you

