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INTRODUCTION

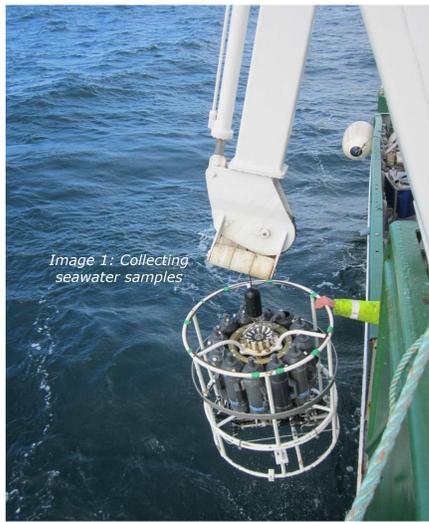
A challenge facing industry is the ability to distinguish maritime accidents from naturally occurring phenomena such as phytoplankton blooms and natural oil seeps [1].

This project aims to link detection and monitoring of these natural and manmade surface slicks with satellite observations. Launch of the sentinel series of satellites provides opportunities for the fusion of *in situ* sampling with remote sensing. Products such as SAR roughness (Sentinel 1) will be used.

Sampling has been carried out across the western Irish coastal shelf on the Celtic Explorer last June (CE18009) and July (CE18010).

PRELIMINARY RESULTS

METHODS



Conductivity Temperature and Depth (CTD) measurements are taken at sea in (Image 1).

Flow cytometry (Image 2) and microscopic enumeration methods are used to identify pico/nano and phytoplankton species. This includes identification of Harmful Algal Bloom species (HAB's).

For chlorophyll concentrations, seawater was filtered through 25 mm GF/F filter. The filters were frozen and analysed back on land.

Baseline optical measurements of CDOM, FDOM and nutrients will be taken from surface waters. Absorption is obtained using Ocean Optics Spectrometers (Image 3).

Studies on the optical characteristics of CDOM formed from actively growing cultures of phytoplankton species such as *Emiliana huxleyi*.

See (Image 4).

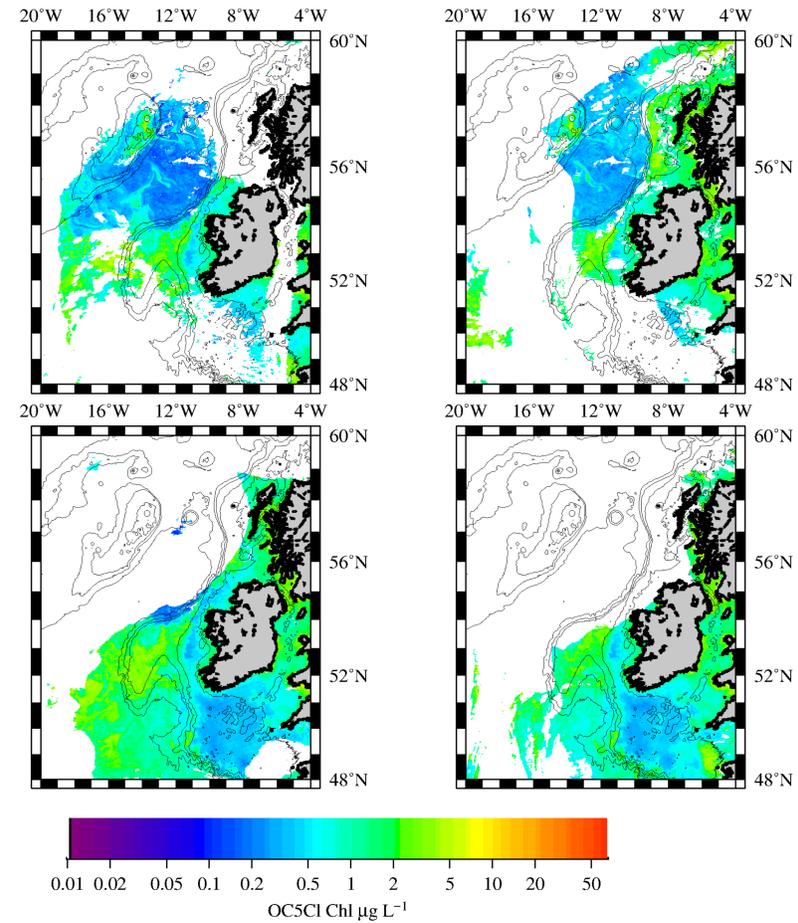
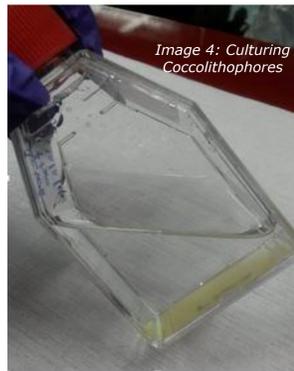
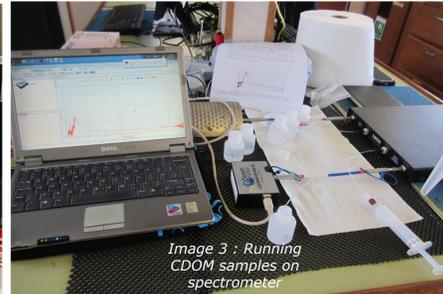
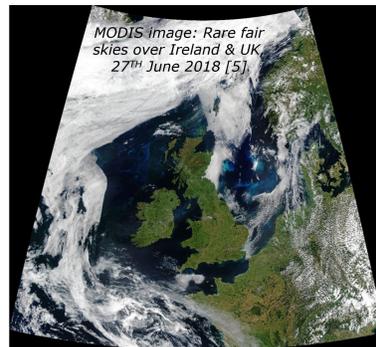


Figure 1: OC5CI Chlorophyll images from June 27, 28, 29 and 30 (Source: CMEMS).

PRELIMINARY RESULTS & DISCUSSION

Satellite observations:

The warm dry summer experienced during WESPAS 2018 provided an unprecedented number of clear sky days for obtaining good satellite images of the ocean colour distribution over the North West European shelf as seen in Figure 1. The ocean colour images showed high chlorophyll levels along the shelf edge and porcupine mound with lower concentrations in the Celtic Sea.



Chlorophyll concentration (5-6 m):

The frozen filters were analysed in the laboratory for chlorophyll a (b & c) concentrations after extraction with 90% acetone using a Telfon grinder and subsequent measurement of the solution absorbance using an Ocean Optics Flame spectrophotometer with a low volume 10 cm pathlength cell and DT-mini light source. The concentration of chlorophyll a was calculated using the trichromatic equation of Jeffrey and Humphrey (1975). [2]

FUTURE WORK

- Baseline studies of CDOM from phytoplankton and other natural sources along the west coast of Ireland.
- Concentrated sampling where oil slicks have been observed.[3]
- Satellite along with airborne hyperspectral observations of surface slicks along the Irish coast.
- Development of a Spectral library via 3D EEM fluorescence.

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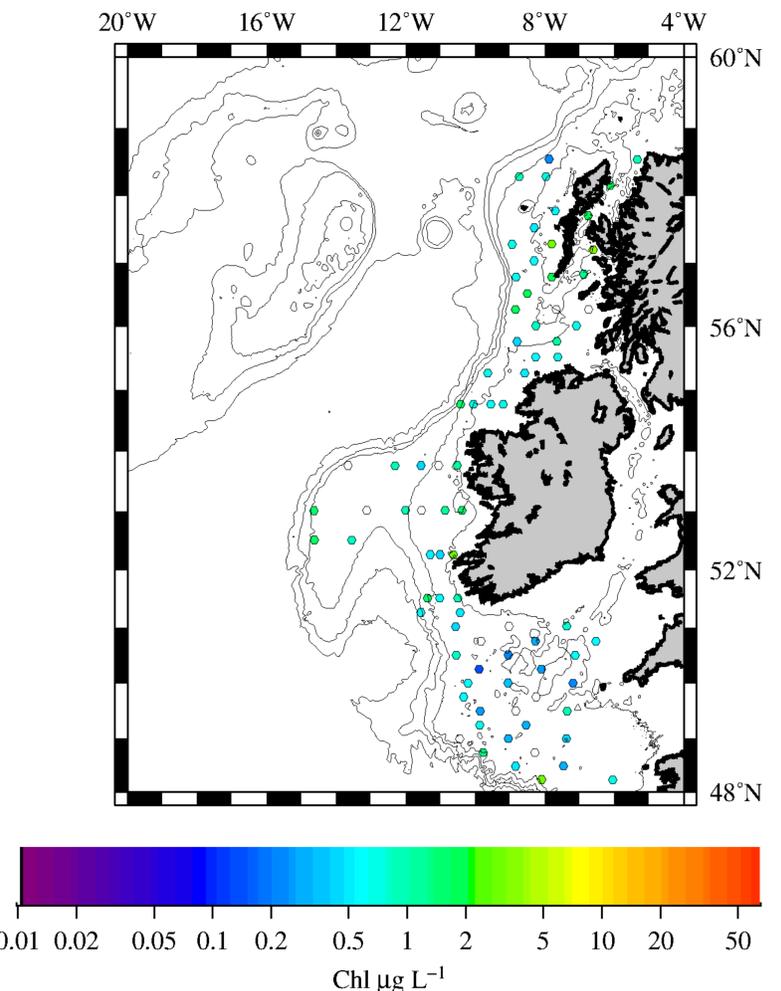


Figure 2: Near surface mixed layer chlorophyll measurements during WESPAS 2018

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- [3] Geert-Jan Vis Geological Society, London, Special Publications 2017:447-443-455
- [4] NASA Earth Observatory images by Joshua Stevens, using VIIRS and MODIS data.