Session: S05

Title: Technological Advancement and Democratisation of Ocean Observing Systems

Convenors: Malcolm Hearn[1], Luisa Cristini[2], Andrew Thaler[3]

1: British Oceanographic Data Centre (BODC), 2: National Oceanography Centre (NOC), 3: Virginia Institute of Marine Science (VIMS)

Oral Presentations

Title: The New UK Polar Research Vessel

Author: Ray Leakey

Scottish Association for Marine Science (SAMS)

Abstract: The Natural Environment Research Council (NERC) has commissioned a new state-of-the-art polar research vessel, the RRS Sir David Attenborough, to enable UK polar scientists to remain at the forefront of marine research in both the Antarctic and the Arctic. The new polar ship will provide a cutting-edge research facility with greater ice-strengthened capability and longer endurance than NERC's existing polar research ships which are coming to the end of their operational life. It will operated by the British Antarctic Survey on behalf of NERC and the UK scientific community. The ship, which is now under construction at Cammell Laird shipyard in Liverpool, will accommodate up to 60 researchers and act as a central hub for a range of data-gathering remote instruments and on-board environmental monitoring systems, including both marine and airborne robotic systems. It will incorporate flexible laboratory space to meet the evolving needs of science over the lifetime of the ship and include a helideck and hangar, and a moon pool. The ship will be ready for operation by 2019. This presentation will outline the new polar research vessel's design, scientific capability and capacity.

Title: Using gliders to study phytoplankton

Authors: Beatrix Siemering[1], Mark Inall[1], Eileen Bresnan[2], Keith Davidson[1]

1: Scottish Association for Marine Science (SAMS), 2: Marine Scotland Science (MSS)

Status: Student

Abstract: Glider deployments offer a new and exciting methodology to study spatial and temporal variability and transport of phytoplankton in shelf sea environments. Gliders are buoyancy driven autonomous underwater vehicles that can dive to depths between the surface and 1000m making continuous measurements of a range of seawater properties such as salinity, temperature and chlorophyll. In

summer 2015 physical and biological data were collected from the Malin shelf using the SAMS glider ‘Talisker’. Satellite data were used to navigate the glider towards areas of high chlorophyll. Additional data on taxonomy was collected during a 2 week cruise in July 2015 on board the research vessel Corystes. High densities of the potentially harmful Phaeocystis and Pseudo-nitzschia were found around hydrodynamic features with unique physical parameters such as the shelf break and salinity fronts. This study provides a novel insight about in-situ bloom development in British waters with potential benefits for harmful bloom modelling, prediction and management using gliders, which are not limited by cloud cover, fixed cruise dates and tracks of scientific boat cruises.

Title: Near real time ocean observation from the Continuous Plankton Recorder: a fusion of old and new technologies.

Authors: George Graham[1], Robert Camp[1], Anthony Walne[1], Simon Halliwell[2] and Phil Lovell[2]

1: The Sir Alister Hardy Foundation for Ocean Science (SAHFOS), 2: Sea Mammal Research Unit (SMRU)

Abstract: In situ observations are a crucial complement to remote earth observation systems or outputs from predictive models, but are costly to collect. As a result, in situ observations are either spatially or temporally constrained which impacts data availability for validation, assimilation or calibration purposes. To address problems of spatial and temporal coverage, the utility of the Continuous Plankton Recorder (CPR) survey network is being investigated as a platform for integrated ocean observations. The CPR network, operated by SAHFOS, has been in near-continuous operation since 1931 and routinely samples more than 11,000 nautical miles of the global ocean per month using Ships of Opportunity. The extent of the CPR network presents exciting possibilities for cost effective collection of oceanographic observations. Recently, CPRs have been augmented for precision in situ measurement of Salinity, Temperature and Chlorophyll-a fluorescence using bespoke sensors, with near real-time data relay, developed by SMRU. Since November 2015, CPR tows in the North Sea, English Channel and N.E. Atlantic have been undertaking operational monitoring using this technology. The fusion of existing infrastructure and new measurement capability provides a cost effective way of obtaining repeat in situ observations over wide spatial scales - 25,000 nautical miles of high precision in situ observations of CTD+F have been collected along monthly repeat tracks to date. These observations are valuable from both an oceanographic research perspective and for validation and calibration purposes, particularly in shelf sea environments where remote sensing can be problematic. Data is transmitted from the CPRs on completion of each tow and the development of the automatic workflow for Quality Control and data processing will be discussed.

The CPR based observations will be compared with other existing measurement networks in the North Sea, English Channel and N.E. Atlantic to illustrate the utility of this approach for integrated surface ocean observation.

Title: Data standards; why standardise data and what are the benefits for oceanography?

Authors: Justin Buck, Louise Darroch and Alexandra Kokkinaki

British Oceanographic Data Centre (BODC)

Abstract: As oceanographic data volumes and complexity grow with the development of new sensors and observing technologies it is becoming increasingly important to process and distribute data efficiently. To this end the application of oceanographic data and software standardisation at levels from sensor to data delivery is on-going across a range of European projects. This will make the ingestion and data processing of oceanographic data more efficient and serve new users such as the producers of 'big data' data products and operational data assimilation/ingestion that require data to be unambiguously ingestible and served via APIs that enable machine to machine interaction. The two primary standards being implemented are the application of World Wide Web Consortium (W3C) Linked Data and Open Geospatial Consortium (OGC) Sensor Web Enablement (SWE) standards1,2. In addition to exposing data to new users the application of such standards will makes it possible readily share data internationally via collaborations such as the Ocean Data Interoperability Platform (ODIP). World standards tend to be open and flexible to accommodate several scientific domains and applications, which can result in various incompatible implementations. To overcome this problem, international collaboration is essential, to enhance communication and specialize the standards across the domain. Collaboratively implementing data standards removes the barriers hindering the effective sharing of data across scientific domains and international boundaries.

Poster presentations

Title: The Australian Coastal Ocean Radar Network – data and potential applications

Authors: Lucy R Wyatt,

School of Mathematics and Statistics, University of Sheffield, Sheffield, UK and College of Science, Technology and Engineering, James Cook University, Townsville, QLD, Australia

Abstract: The Australian Coastal Ocean Radar Network (ACORN) is a facility of the Australian Integrated Marine Observing System (IMOS*). Until late 2014 it was

based at James Cook University in QLD and has now moved to UWA in Perth, WA. During the period 2011 to 2014 I was its Director and in this paper I will present some of the data we obtained, some of the applications that have used these data and some potential applications that I had been promoting. To date ACORN has deployed twelve HF radars (a mix of US SeaSondes and German WERAs) in pairs at locations on the coast where there was a scientific driver for, primarily, surface current data. Additional deployments are in the planning stages. Validations of current, wave and wind direction measurements will be presented. The data are being used for model validations, for studies of the dynamics of the East Australian and Leeuwin Currents and their interactions with shelf seas; of sea breezes and the dispersion of particles in the southern Great Barrier Reef; of meteo-tsunamis in the Eastern Indian Ocean; of waves in the Southern Ocean and to support long-distance swimmers. Trials of the use of the current data in search and rescue operations are being conducted; an early example of related use was in the determination of the likely original location of a human head found on an Island off the coast of WA. Potential applications under discussion are in bush fire modelling, fisheries and ports and harbours.

Title: A Deep Learning System for Analysis of Fisheries Surveillance Video and Automated Monitoring of Catch Quota

Authors: Mr. G. French[1], Dr M. H. Fisher[1], Dr M. Mackiewicz[1], Dr C. L. Needle[2]

1: University of East Anglia (UEA); 2: Marine Scotland

Status: Early Career

Abstract: This paper presents a work-in-progress computer vision tool that is designed to analyse video from an existing CCTV system that is installed on board fishing trawlers for the purpose of monitoring discarded fish catch. Input to the system is derived from a video camera overlooking a conveyor where fish are processed. The system aims to support human experts currently involved in counting, measuring and classifying discarded fish. The system was developed for the purpose of gathering data to be used by fishing crews for internal process monitoring, by on-shore governmental bodies for regularity compliance monitoring – specifically the European Union Common Fisheries Policy – and scientific agencies for monitoring fish stocks. The system is designed to minimise disruption to the operational environment of a trawler by requiring only an un-obstructed view of the conveyer belt. As a consequence, it must handle the often challenging footage obtained in real-world conditions rather than impose restrictions on the working practices of the crew. Our approach uses state-of-the-art deep learning based techniques. Deep learning is a class of computer vision algorithm that has significantly improved the effectiveness of the automated analysis of images and video in the last few years. We performed extensive tests of the algorithm. The fish

relative count error ranges from 2% to 16% per fishing trip, which is a promising result in this ongoing work as the required figure for this task is 10%.

Title: Euro-Argo: a new European Research Infrastructure for climate change research and operational oceanography

Authors: S. Pouliquen[1], G Obolensky[1] and Euro-Argo European Research Infrastructure Consortium (ERIC).

1: Institut français de recherche pour l'exploitation de la mer (IFREMER)

Abstract: In May 2014, the Euro-Argo research infrastructure became a new European legal entity (Euro-Argo ERIC). The objective is to organize a long term European contribution to the international Argo array of profiling floats. Argo is now the most important global in-situ observing system required to observe and understand the role of the ocean on the earth climate. Euro-Argo is also an essential component of the in-situ infrastructure required for the Copernicus Marine Core Service. Euro-Argo will thus develop European contribution to the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS). We will provide an overview of the development of Euro-Argo over the past years, detail the now agreed Euro-Argo long term organization, and provide some highlights on the work-plan for the years to come and the Argo extensions for the next decade especially to abyssal oceans and biogeochemical measurements. We will also illustrate some key achievements on the use of Argo in Europe both for operational oceanography, ocean and climate change research.

Title: FixO3 Network Project: Integration, harmonization and innovation

Authors: Richard Lampitt[1] and FixO3 Consortium

1: National Oceanography Centre (NOC)

Abstract: The Fixed point Open Ocean Observatory network (FixO3, http://www.fixo3.eu/) seeks to integrate 23 European open ocean fixed point observatories in the Atlantic Ocean and Mediterranean Sea and to improve access to these infrastructures for the broader community. These provide multidisciplinary observations from the air-sea interface to the deep seafloor. Started in September 2013 with a budget of 7 Million Euros over 4 years, the project has 29 partners drawn from academia, research institutions and SME's coordinated by the National Oceanography Centre, UK. The project is structured in 12 Work Packages aimed to:

- integrate and harmonise the current infrastructures and processes
- offer free access to observatory infrastructures to those who do not have such access, and free and open data services and products

- innovate and enhance the current capability for multidisciplinary in situ ocean observation

Here we present the programme's key achievements mid-way, the current activities and expected results. Emphasis will be on FixO3-generated tools and products and their applications for the wider oceanographic community for the benefit of science, industry and policy.