iMarDIS

Integrated Marine Data and Information System

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iMarDIS

http://www.imardis.org

SEACAMS

PRIFYSGOL BANGOR UNIVERSITY

ERDF

Llywodraeth Cymru Welsh Government

Ewrop & Chymru: Buddsoddi yn eich dyfodol

Cronfa Datblygu Rhanbarthol Ewrop

Europe & Wales: Investing in your future

European Regional Development Fund

Introduction

Lessons learnt in SEACAMS 1

Collaborative research

Data intensive science

iMarDIS – design and delivery

Lessons learned in SEACAMS 1

Business requires:

- **solutions** to specific problems identified through 2-way dialogue
- **high resolution quality assured data** in an industry-agreed format that can be rapidly retrieved and manipulated
- lack of a **single point of access** for existing data and information hampers efforts to acquire knowledge that informs decisions.
- ability to address environmental impacts on **long time scales** (100 years)
- State of the art **data management**

The problem – industry pull

Energy sector needs information & evidence

Information needs:

- Site selection
- Resource availability
- Intermittency
- Multi-decadal variability
- Habitat vulnerability
- Coastal morphology
- Policy compliance

The evidence must be:

- Based on sound science
- Underpinned with reliable quality assured data
- Able to withstand legal scrutiny
- Transparent and auditable (from data to decision)
- Collected efficiently and cost effectively

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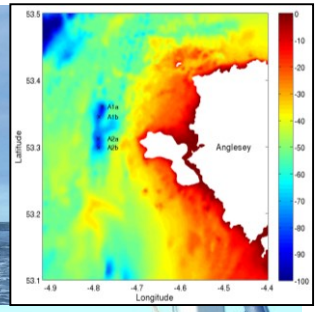
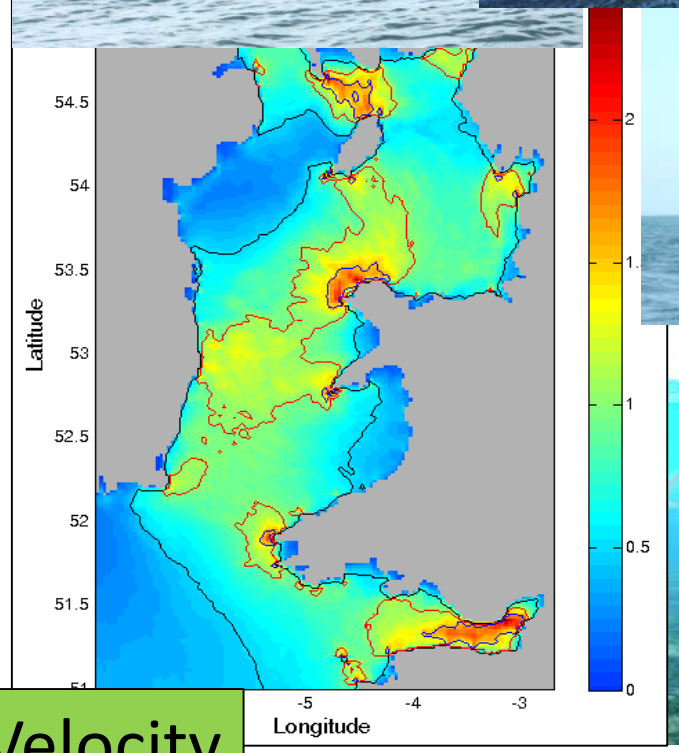
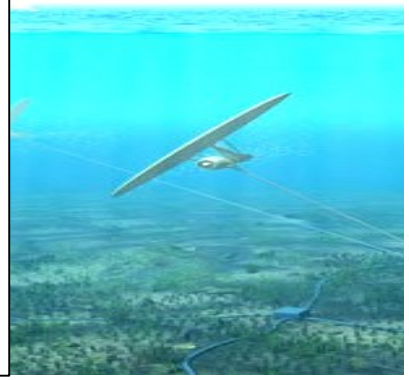
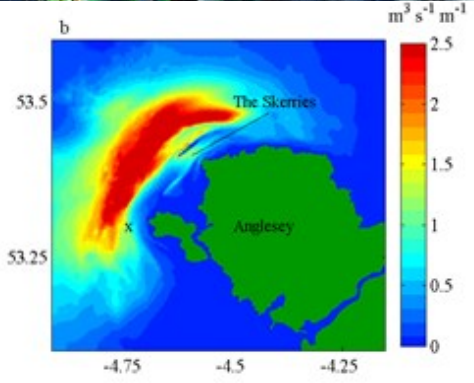
Collaborative Research

marine renewable energy









Velocity

morlais
ANGLESEY MARINE ENERG

Minesto

Wave Hub

TIDAL LAGOON POWER

Examples of proposed collaborative research

- Distribution of marine mammals & pelagic ecology in high current areas
- Detection probability of acoustic recorders to monitor bottlenose dolphins
- Behavioural response study of marine mammals in relation to MRE activity
- Wake characteristics of Tidal Energy Converters and device-environment interactions
- **Phase optimization of Welsh MRE developments (including lagoons) to provide balanced baseload generation to the UK grid**
- Wave-current interaction and analysis of impacts on the tidal resource
- Effect of man-made structures (e.g. wrecks) on ecology in high current areas
- Tools for assessment of impact & benefits of Marine Renewables on fish assemblages

Examples of SEACAMS information products and use

Information product	Requirement
Marine mammal (presence, absence)	Kill quotas for MRE schemes
Bedload transport	Cable siting
Sediment/contaminant studies	Baseline for environmental impact studies
Subsurface geotechnics	Foundation design
Tidal range, water level	Resource characterisation
Wave height and period	Wave regime characterisation (model calibration & validation)
Tidal current (power)	
Multi-beam acoustics (bathymetry)	Inputs to models that support multiple user requirements

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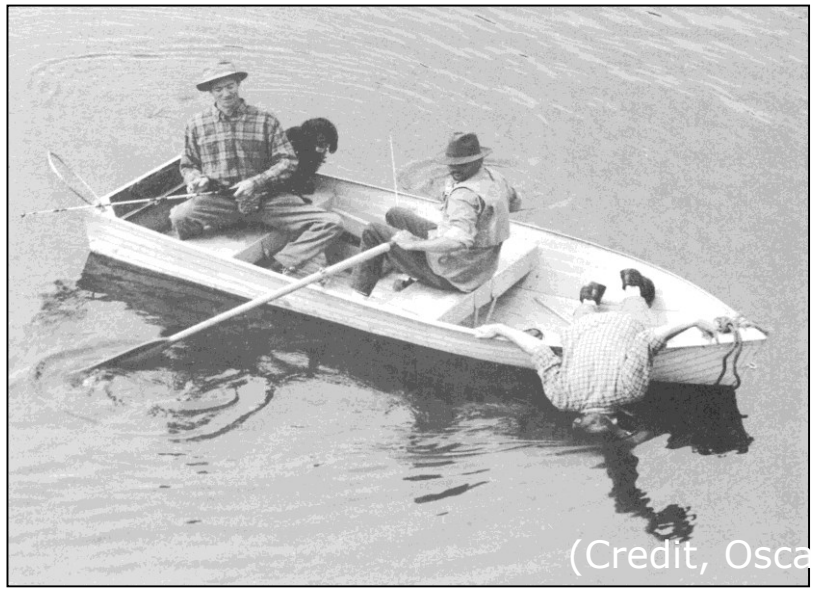
The age of observation & simulation

- Modern science
  - Data and compute-intensive
  - Integrative, multi-scale
- Multi-disciplinary collaborations to address complexity
  - Individuals, groups, teams, communities

http://research.microsoft.com/en-us/collaboration/fourthparadigm/

Times have changed - & observations

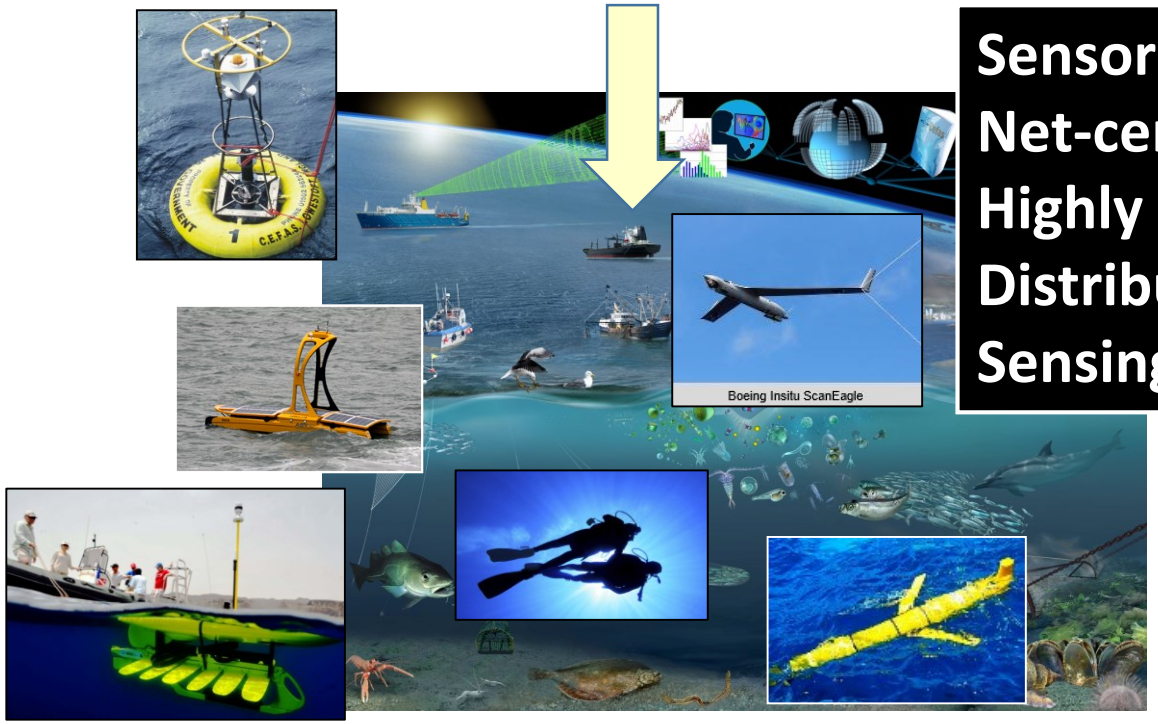


Transforming environmental observations

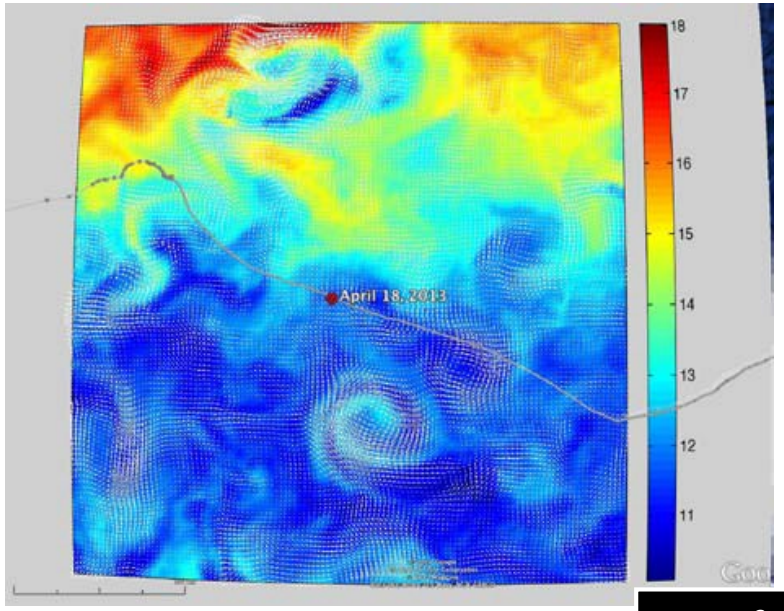
Platform-centric Sensing Systems

A transformation in the way we collect data!

The age of observation and simulation



Sensor driven, Net-centric, Highly Distributed Sensing Systems

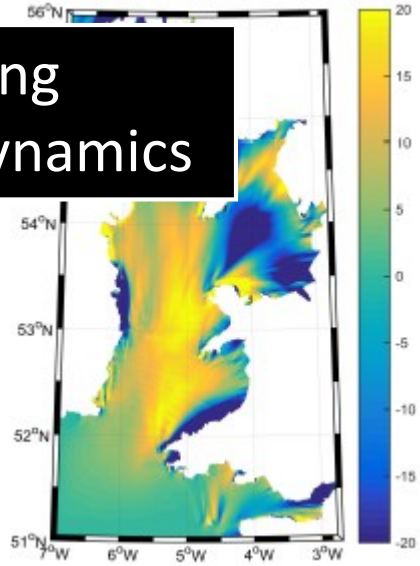


Sea of data

UAV

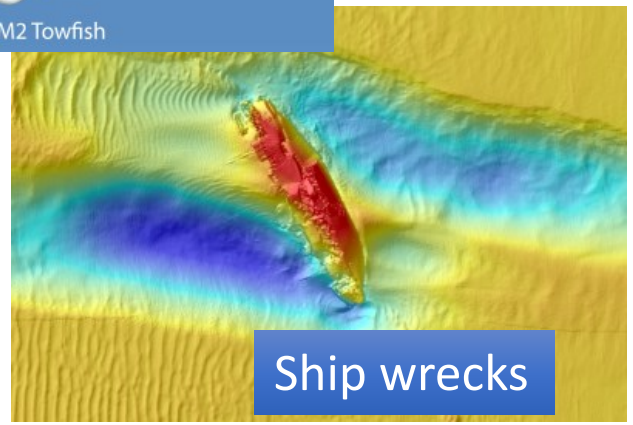
Remote sensing

Modelling hydrodynamics

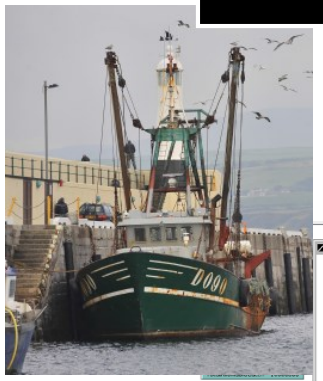


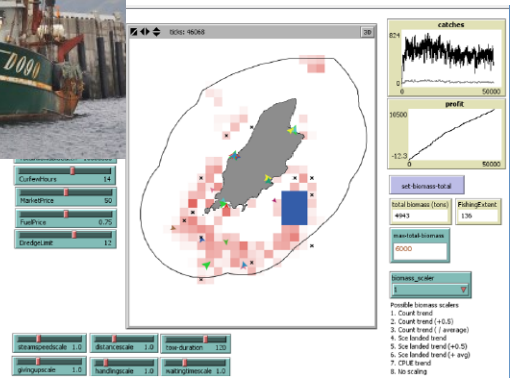
Moored Acoustic Array

Sonar

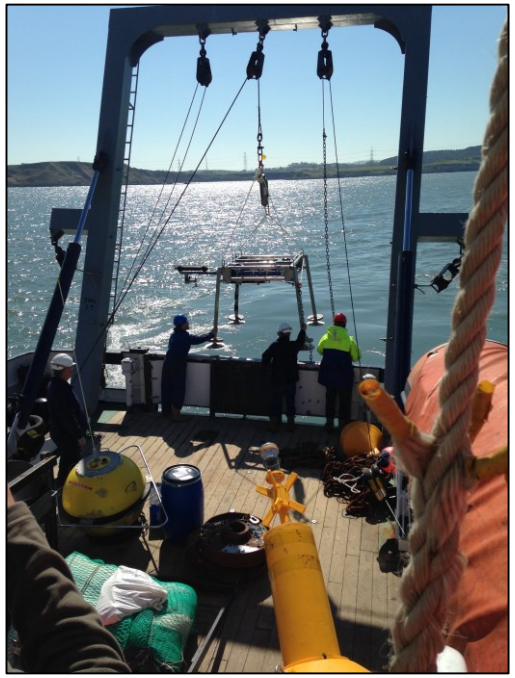


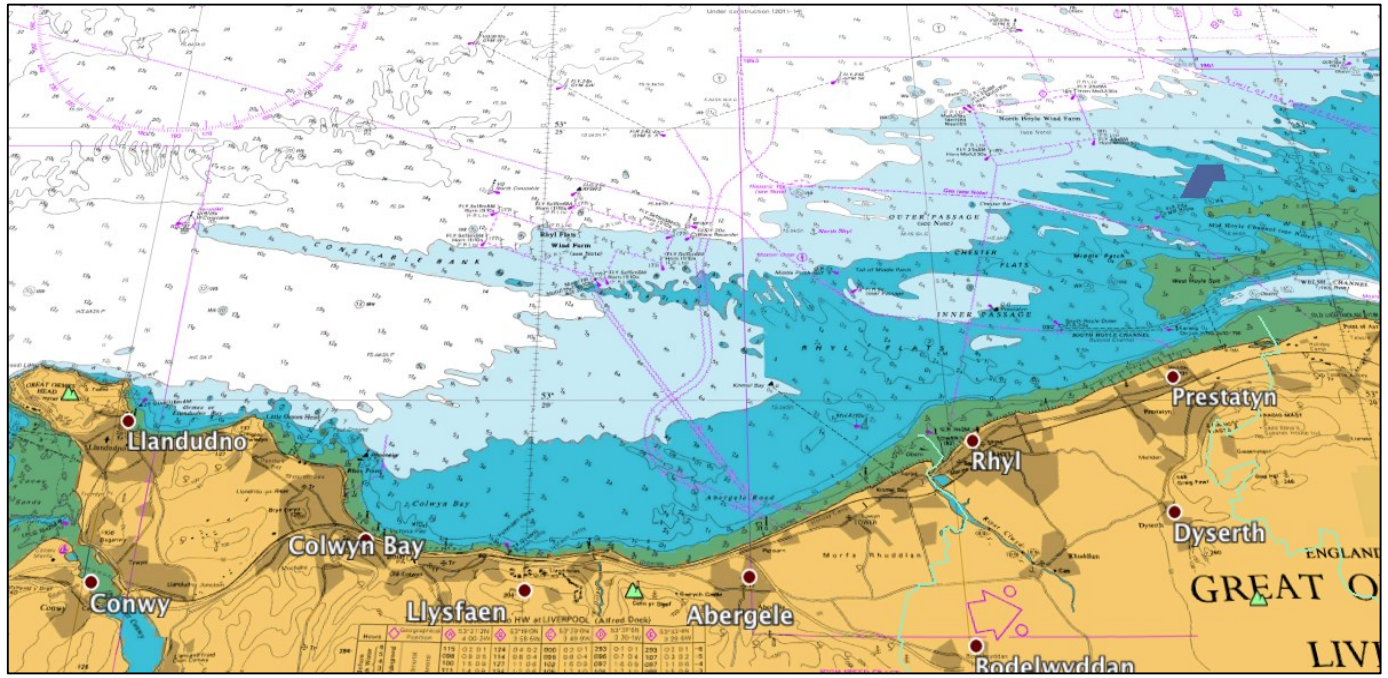
Modelling fishers behaviour





Nearshore coastal observatory network





Observing nearshore processes to inform development and operation of tidal range energy

- Characterisation of nearshore **wave properties**
- Tidal and wave-driven **current intensity**
- **Turbulence** dissipation rates
- **Sediment transport** pathways and **storm impact**

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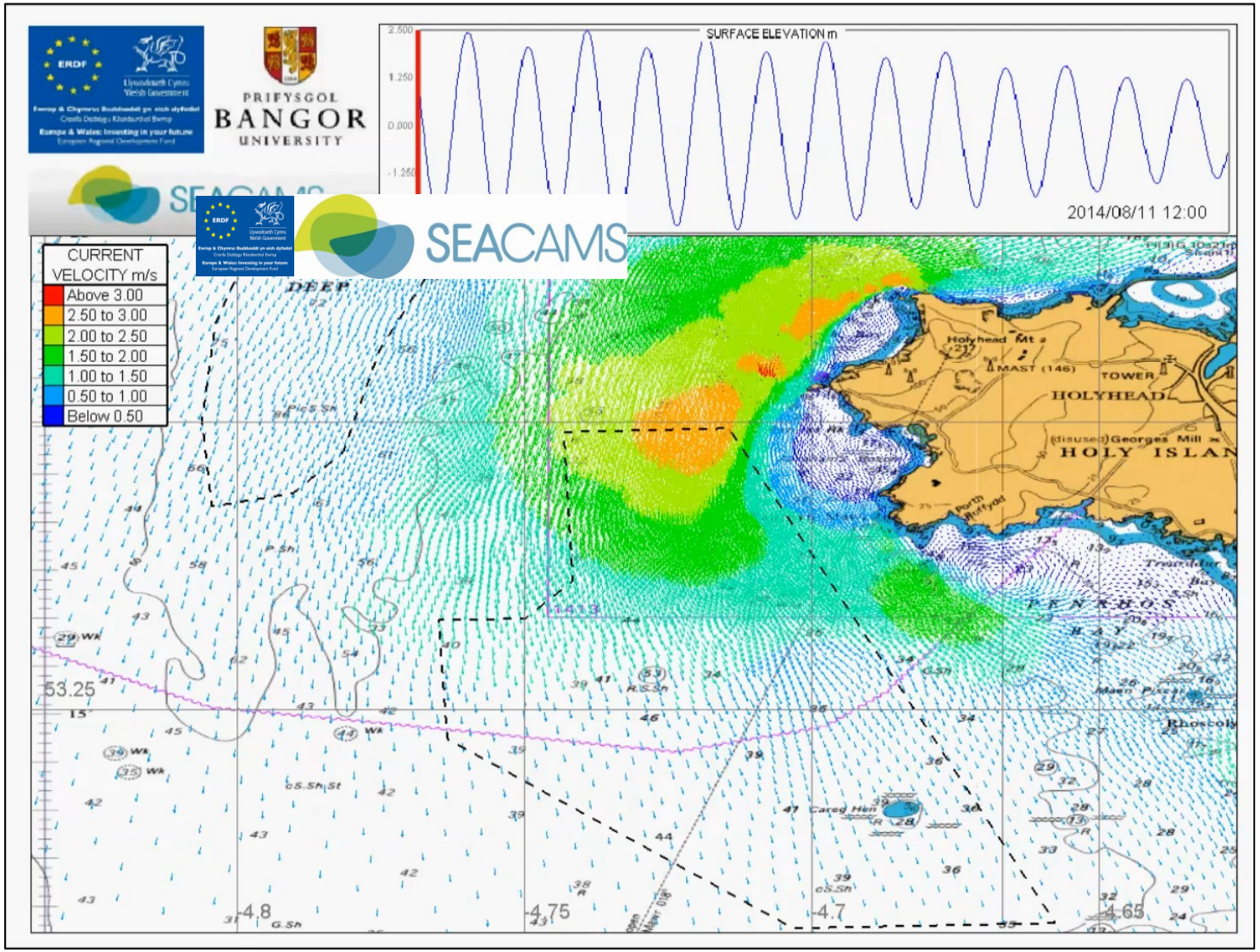
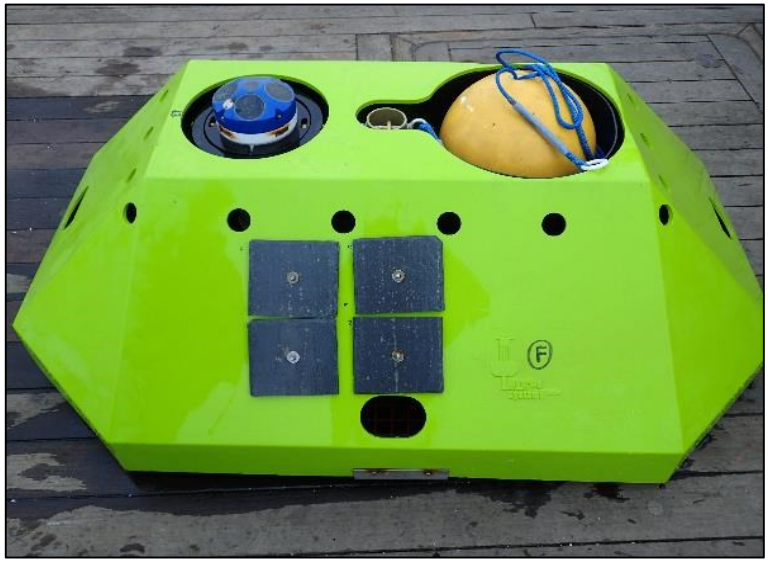
Currents: Model predicted & observed



Purpose

- Quantify the hydrodynamic resource
- Optimising turbine location
- Assessing environmental impacts



ADCP instruments placed on the seabed measure the current speeds & direction

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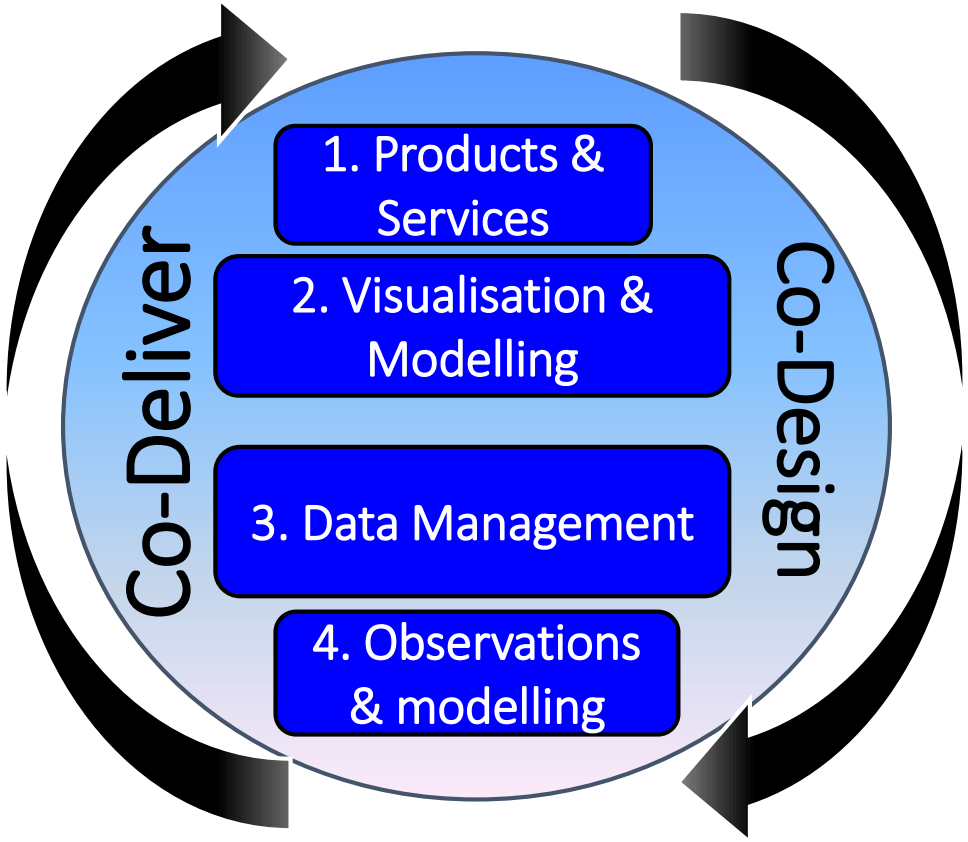
Integrated marine data and information system

1. Products & Services

- Co-design with stakeholders
- Targeted products & services
- Responsive to changing needs
- Multi-purpose for re-use

2. Analytics and visualisation

- Software tools filter data
- Tool for visualisation
- Data mining to unlock knowledge in data
- Generation of forecasts



3. Data management

- Tools to ingest, secure and distribute data
- Delayed mode and real-time data capability
- Harmonised with UK & Europe

4. Observations & Modelling

- Distributed, sensor driven
- High resolution observations
- Delayed mode & real-time
- Simple and complex numerical model

iMarDIS Scope

Data collection

- Ship spatial surveys, intertidal remote sensing, seabed and surface moorings
- Multi-disciplinary data

Data management

- Real-time data assembly
- Delayed mode data assembly
- Data storage
- Data access, catalogue, data discovery

Analysis & visualisation

- Downloadable data tools
- Web-based dynamic visualisation
- Collaboration and networking tools

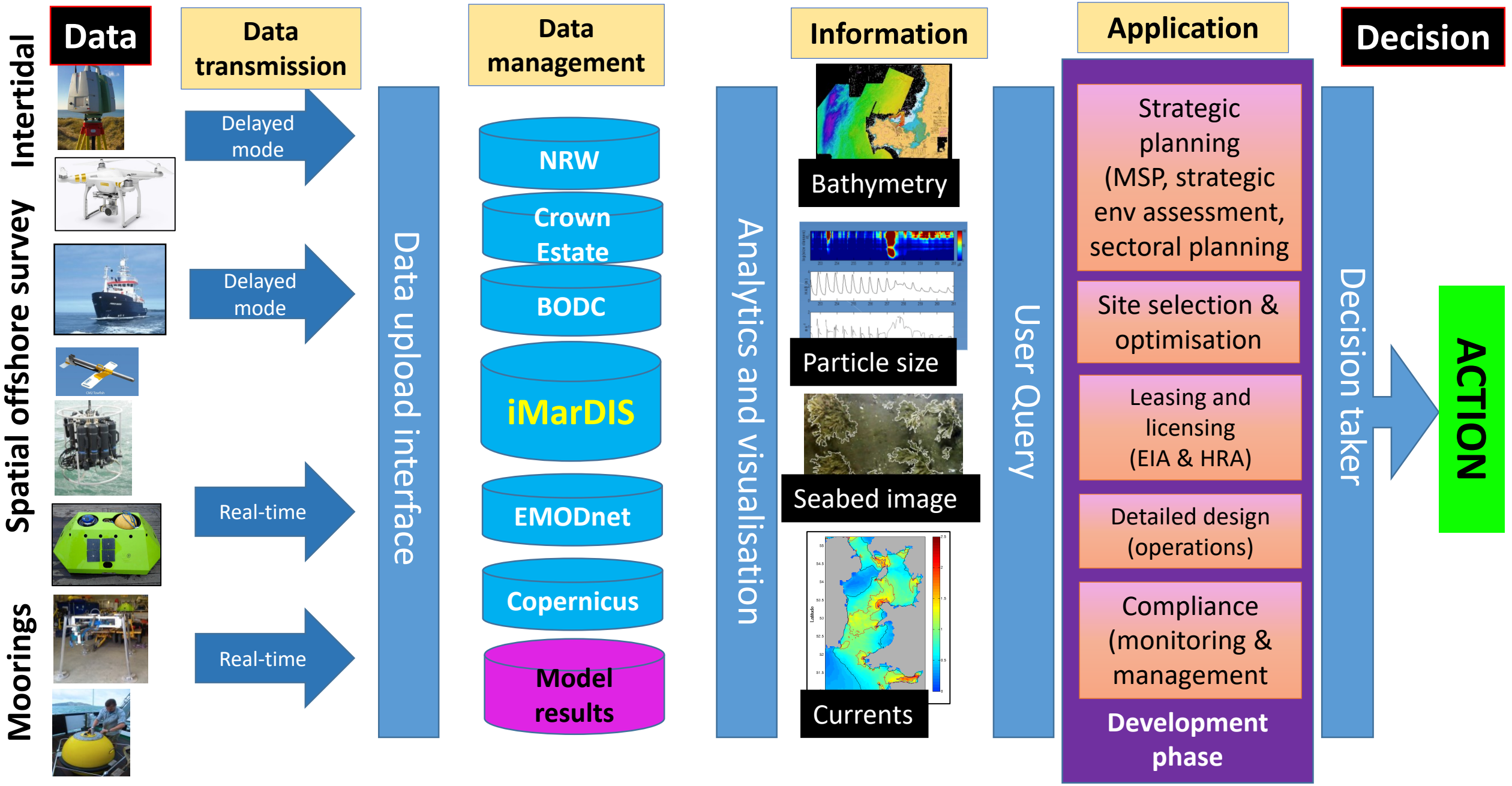
Interpret

- Software products
- Pre-packaged models and advanced tools for presentation
- Advanced numerical model modelling

Bespoke products & services

- Scalable products and services tailored to meet user requirements
- Data and information download services

iMarDIS - Integrated Marine Data and Information System



Summary and conclusions

SEACAM1 lesson learnt lay the foundations for iMarDIS

Recognised need for to 2-way dialogue

Data intensive science has transformed the way we observe, simulate and understand our seas and coasts

We need a transformation in the way we manage the ‘data deluge’ to realise its full potential for all stakeholders

Co-design and co-delivery are essential to ensure iMarDIS meets stakeholder needs

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Thanks for listening…….