



# IRSO 2023



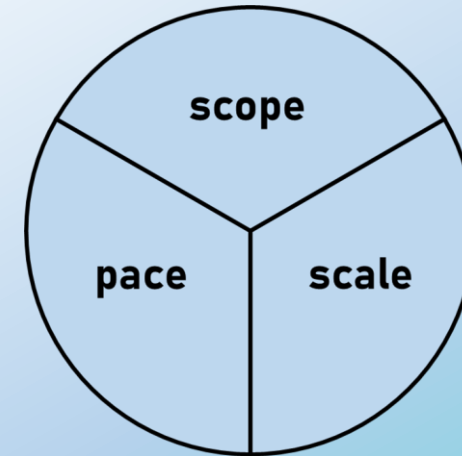
Natural  
Environment  
Research Council

## We need to further define:

The **Scope** of activity – process studies/sustained observations/monitoring/forecasting

The **Scale** of activity – where, when, how often?

The **Pace** of change– what are the pull and push factors?

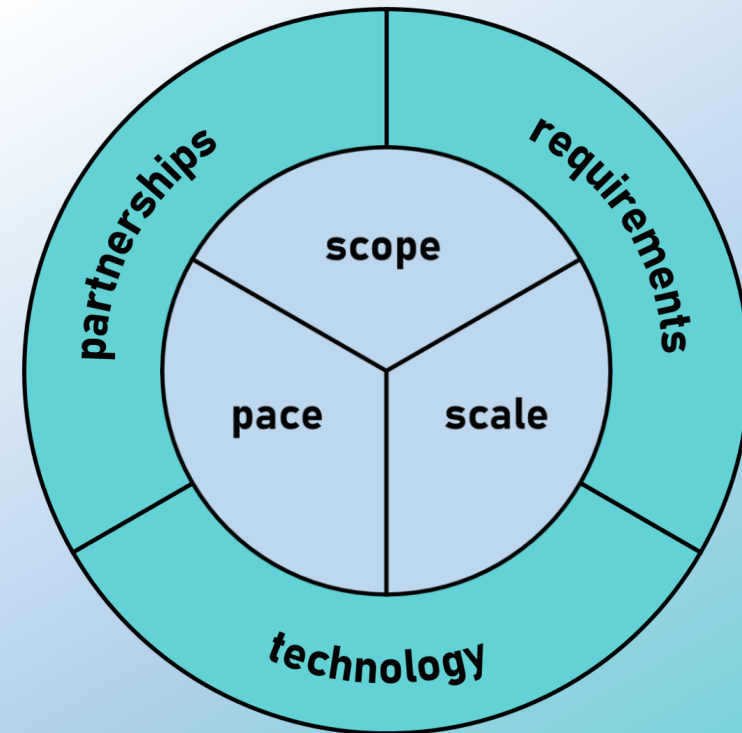


## We need to further define:

How the **requirements** (set by the science community) shape the scale and scope?

How **technology** will drive the scale and pace?

What **partnerships** might be supported by the scope and pace?



**We need to further define:**

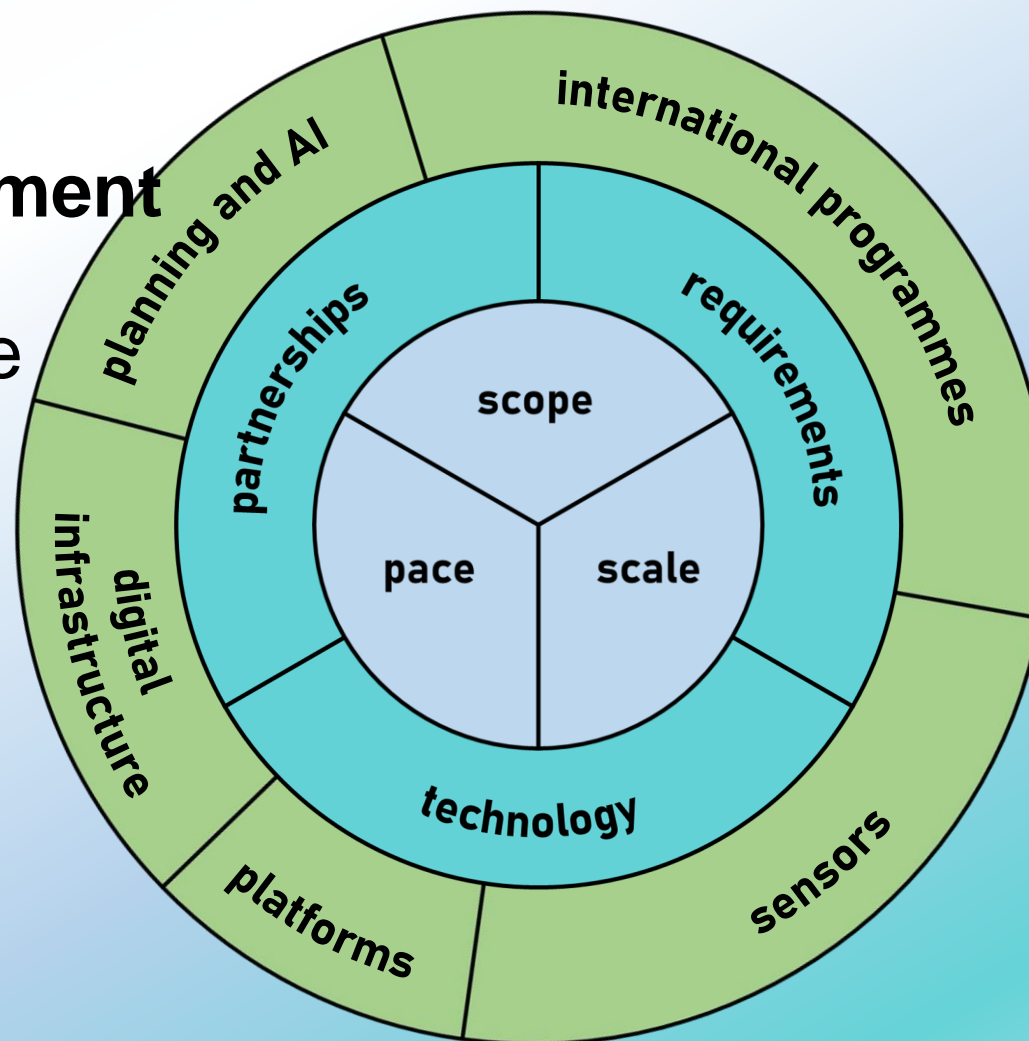
How to accelerate **Sensor development**

How to ensure **Platforms** deliver the necessary coverage

How the **Digital infrastructure** can support FAIR principles

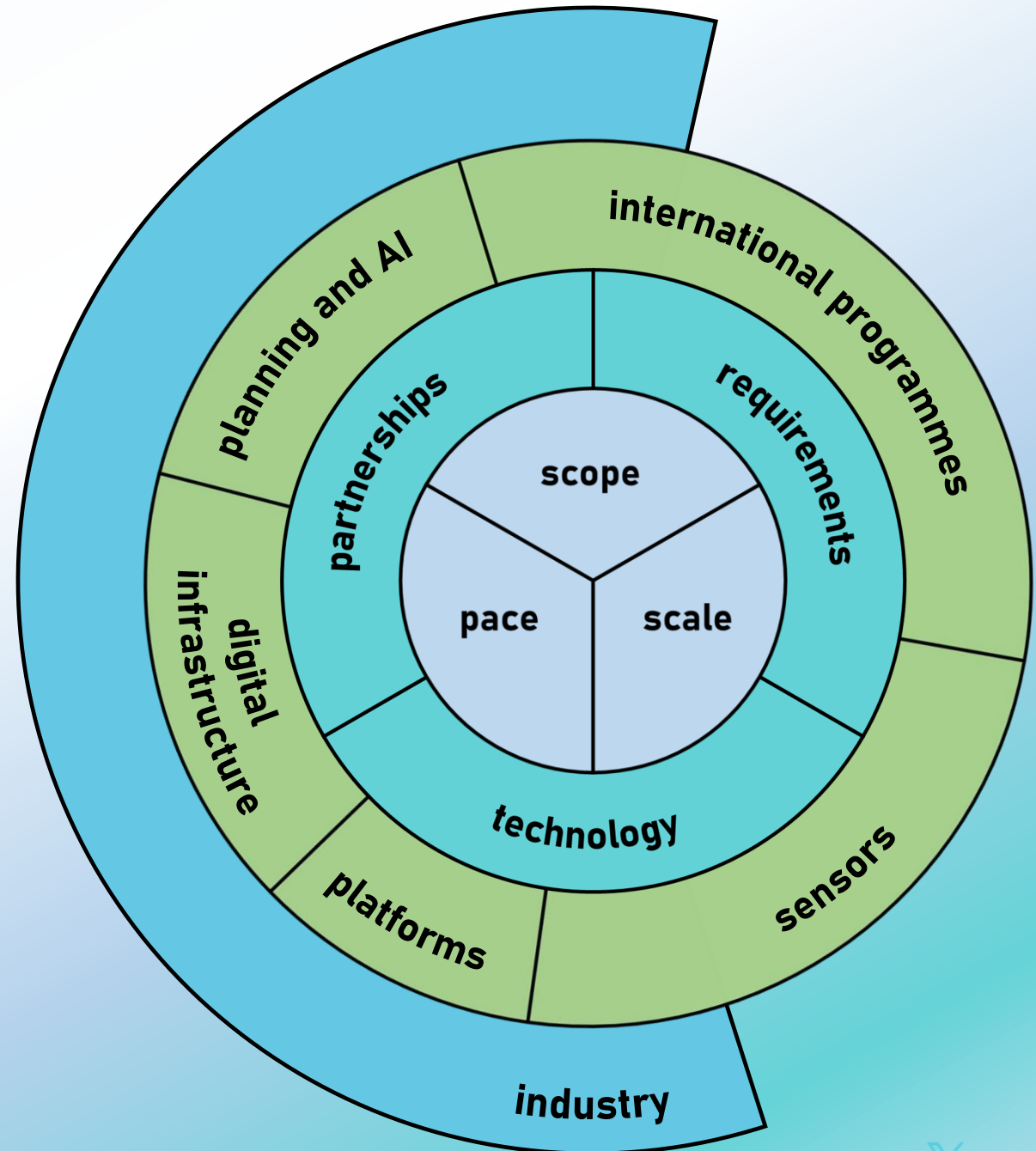
How **Planning** frameworks can support network effects

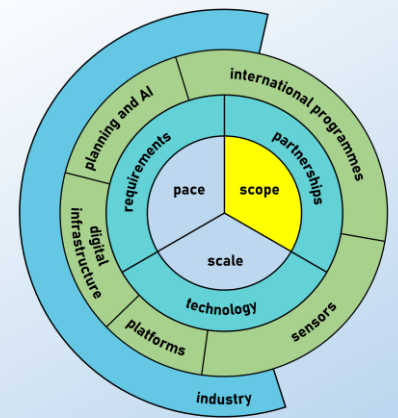
How to align with **International Programmes**



## We need to further define:

How we engage with industry -  
 join up R&D programmes,  
 develop long-term relationships  
 with suppliers, share risk and  
 reduce costs

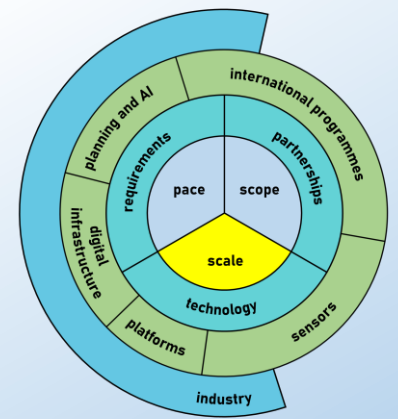


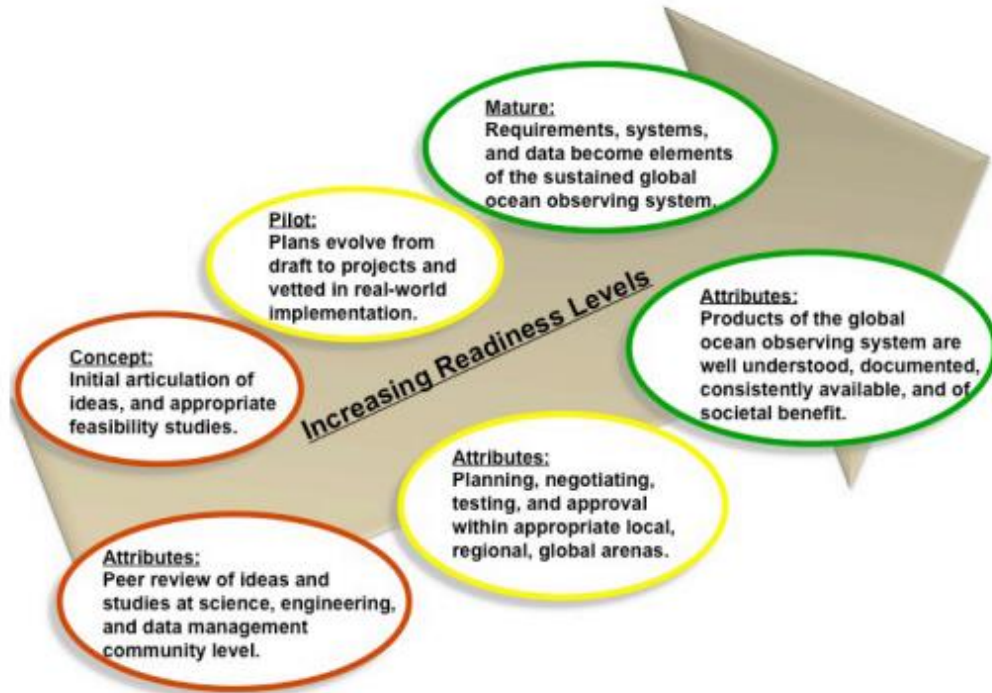
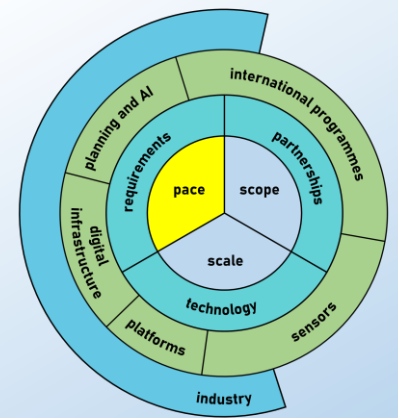


- What are the future scientific priorities?
- What rate of observation is required to support future models? How might the concept of Digital Twins inform that?
- How far are scientists testing the boundaries between sustained and experimental observations with the technology and research infrastructure available today and how might that change in the future?

# FMRI Scale

- A direct comparison between autonomous platforms and research ships is unhelpful in this transition (but often happens).
- Instead, we should ‘calculate’ what is required to support the likely requirements for sustained and experimental observations, double it to account for optimism bias and stuff breaking and then reduce by 1.3 to benefit from data being truly findable, accessible, interoperable and retrievable:



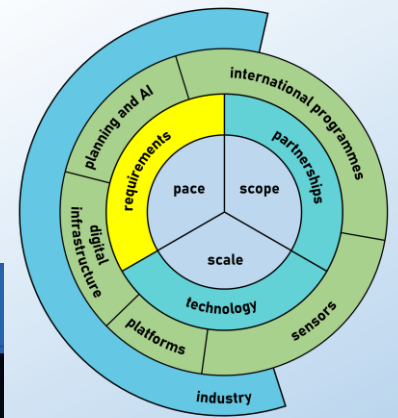


**Figure 5. The Concept of Readiness Levels.** How ocean observing activities will be assessed for inclusion in the Framework for Ocean Observing. The scale and scope of activities at each readiness level will vary according to the needs of a particular EOVS.

The pace is informed by the level of investment, the level of interoperability required, the robustness and reliability necessary, the precision and accuracy mandated and the willingness to adopt and adapt to using those new technologies.

A Framework for Ocean Observing. By the Task Team for an Integrated Framework for Sustained Ocean Observing, UNESCO 2012, IOC/INF-1284, doi: 10.5270/OceanObs09-FOO



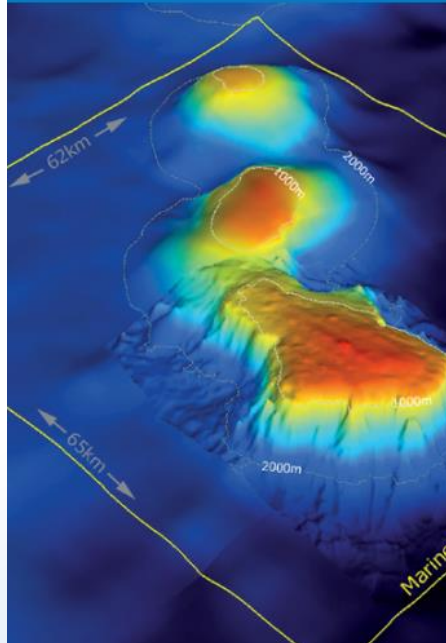


EUROPEAN SCIENCE FOUNDATION MARINE BOARD

Position Paper 18

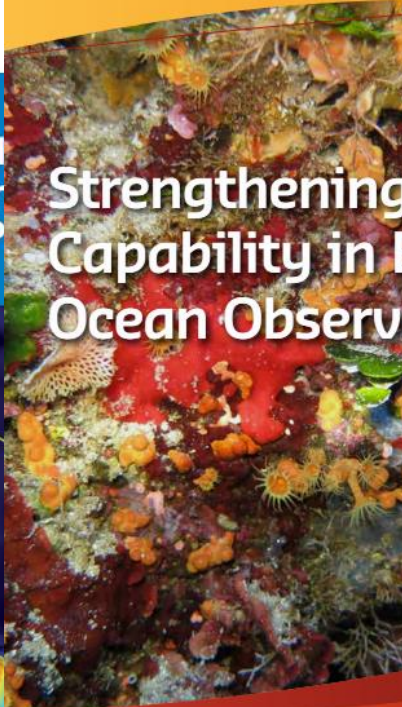
## Achieving Ecologically Sustainable MPA Networks in Europe: Science Needs and Policy Options

April 2013



## Future Science Brief

### Strengthening European Capability in Ecosystem Modelling and Ocean Observations



[www.marineboard.eu](http://www.marineboard.eu)

## Future Science Brief

### Ocean Oxygen

The role of the Ocean in climate change, how we breathe and the threat of ocean deoxygenation



[www.marineboard.eu](http://www.marineboard.eu)

## Future Science Brief

Nº 4 October 2018

### Enhancing Europe's Capability in Marine Ecosystem Modelling for Societal Benefit

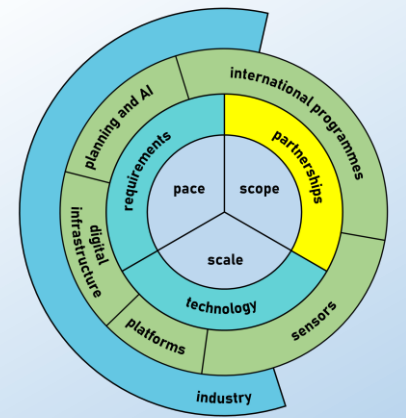


European MARINE BOARD  
Advancing Seas & Ocean Science

[www.marineboard.eu](http://www.marineboard.eu)

# FMRI Partnerships

- GROOM II (<https://www.groom-ri.eu/activities/>)
  - Providing efficiency and economy of scale
  - Ensuring high quality data and access to data



## GROOM RI

### OUR VISION

Be the European Research Infrastructure harnessing the advantages of Marine Autonomous Systems (MAS) to provide high-quality ocean observation data and services for the benefit of society, enabling scientific excellence and moving towards net-zero activities.

### OUR MISSION

This European Research Infrastructure integrates national infrastructures for Marine Autonomous Systems (MAS) to provide access to platforms and services to the broadest range of scientific and industrial users, as well as other ocean observing RIs. It maintains a unique centralized provision of cyber-infrastructure, data and knowledge for the optimized use of MAS to study climate and marine environments, and to support operational services and the blue economy.

[More Info](#)

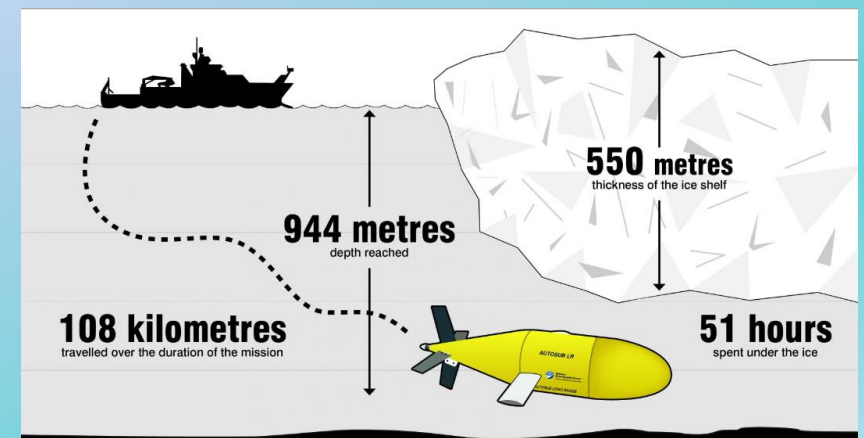
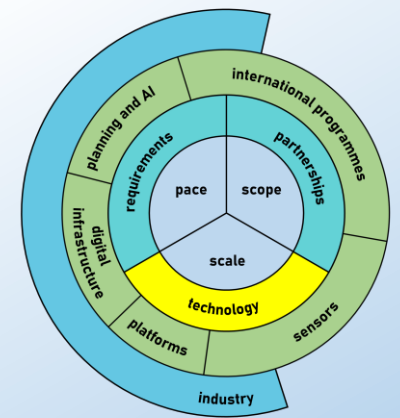
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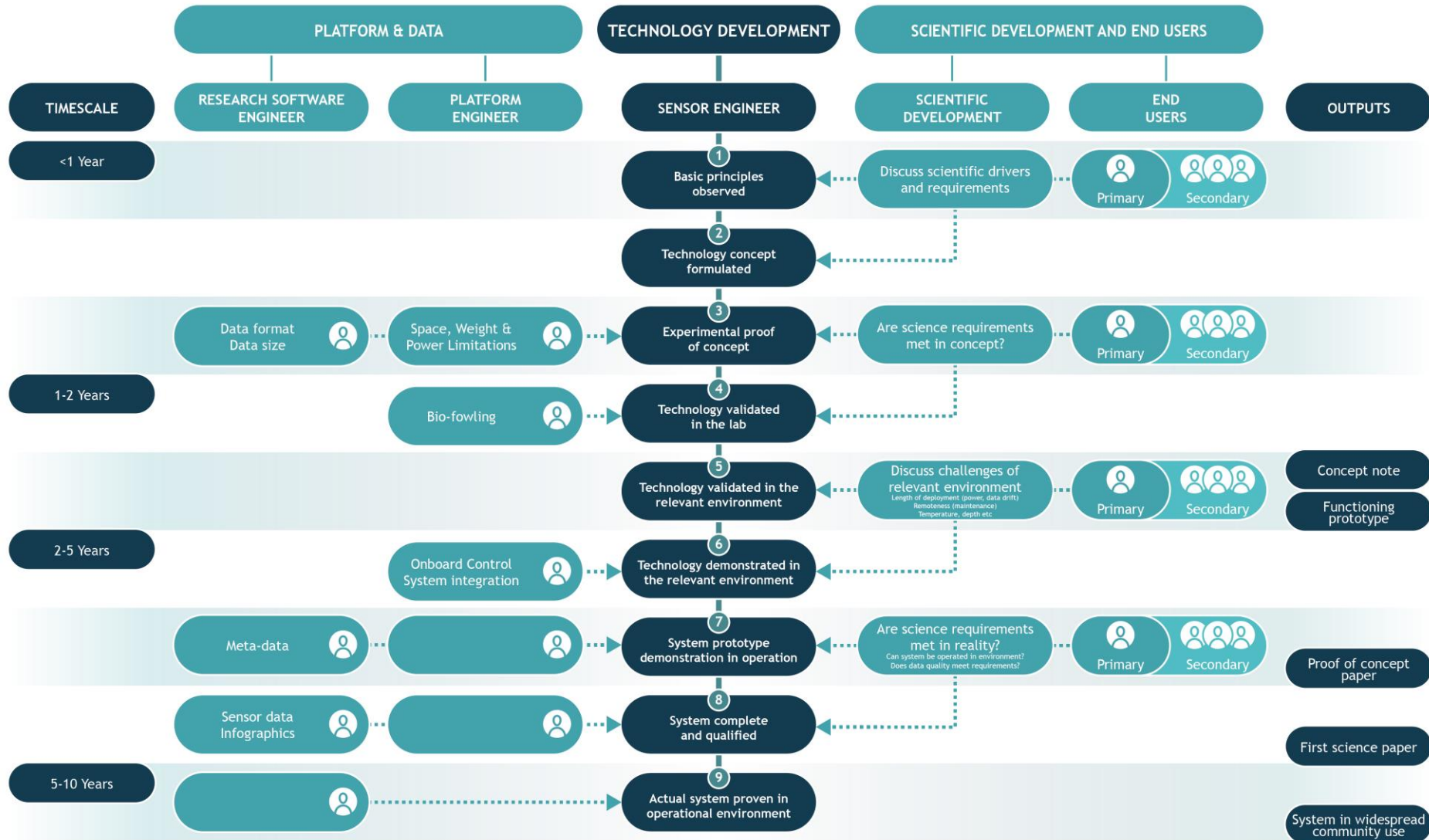
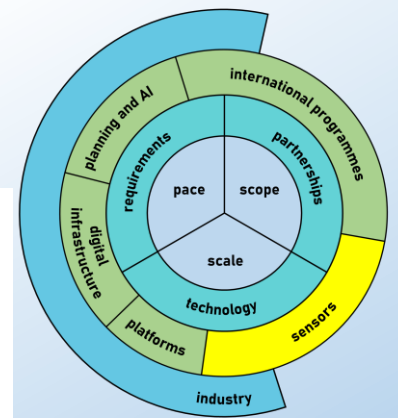
POSITION REMOTELY MONITORED

PLEASE KEEP CLEAR

# FMRI Technology

- Much of the platform technology is advancing at a predictable pace but AI and ML are about to transform how the technology is ‘bought together’ and used to deliver data to multiple users in real time.
- Regulation remains an area of uncertainty as does the application of UNCLOS MSR rules for autonomy.
- Easily integrated sensors remain the priority development area

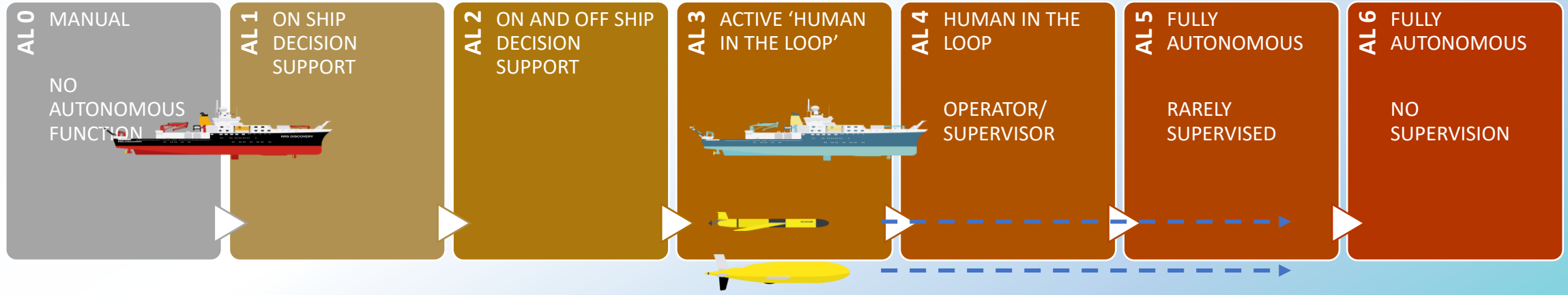
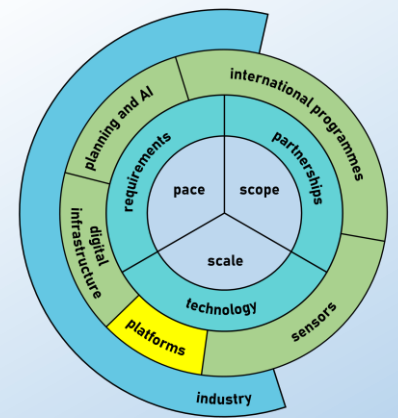






# FMRI

## Platforms regulation/training/accreditation



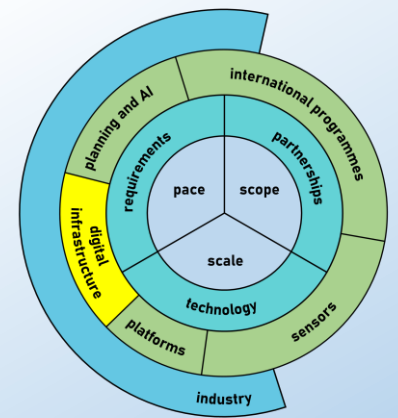
Australian Journal of Maritime & Ocean Affairs

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/ramo20>

Identifying seafarer training needs for operating future autonomous ships: a systematic literature review

Reza Emad, Hossein Enshaei & Samrat Ghosh

Reza Emad, Hossein Enshaei & Samrat Ghosh (2021): Identifying seafarer training needs for operating future autonomous ships: a systematic literature review, Australian Journal of Maritime & Ocean Affairs, DOI: 10.1080/18366503.2021.1941725



**MFP | Portal** Programme My Schedule Training & Certificates My Profile Leigh Storey

HYBRID TIMELINE MAP SHIP SCHEDULE Ships Today Period: 01/01/2023 - 01/01/2024 12 Months

2023

**Discovery**

DY158 DY157 DY164 DY166 DY167 DY169 DY170

**James Cook**

JC22 JC241 JC246 JC247 JC249 JC251 JC254

**Autonomous Deployments**

ALTIMETER TRIALS HECLA ILS PELAGIO YEAR 1 - PELAGIO\_OMG1 THE GULF STREAM CONTROL OF THE NORTH AT BIOPOLE- MOGLI #2 - MOGLI 002 PELAGIO YEAR 1 - PELAGIO\_SLOCUM1 SLOCUM T ELLETT ARRAY 9 (SEC) ELLETT ARRAY 10 (SEC)

Map showing ship locations: James Cook, Discovery

**MARS NMEP Trial**

DY166 Discovery 18 Days 22/1814

Southampton - United Kingdom → Southampton - United Kingdom

Mob (start): 16/06/2023 Dock: 05/07/2023

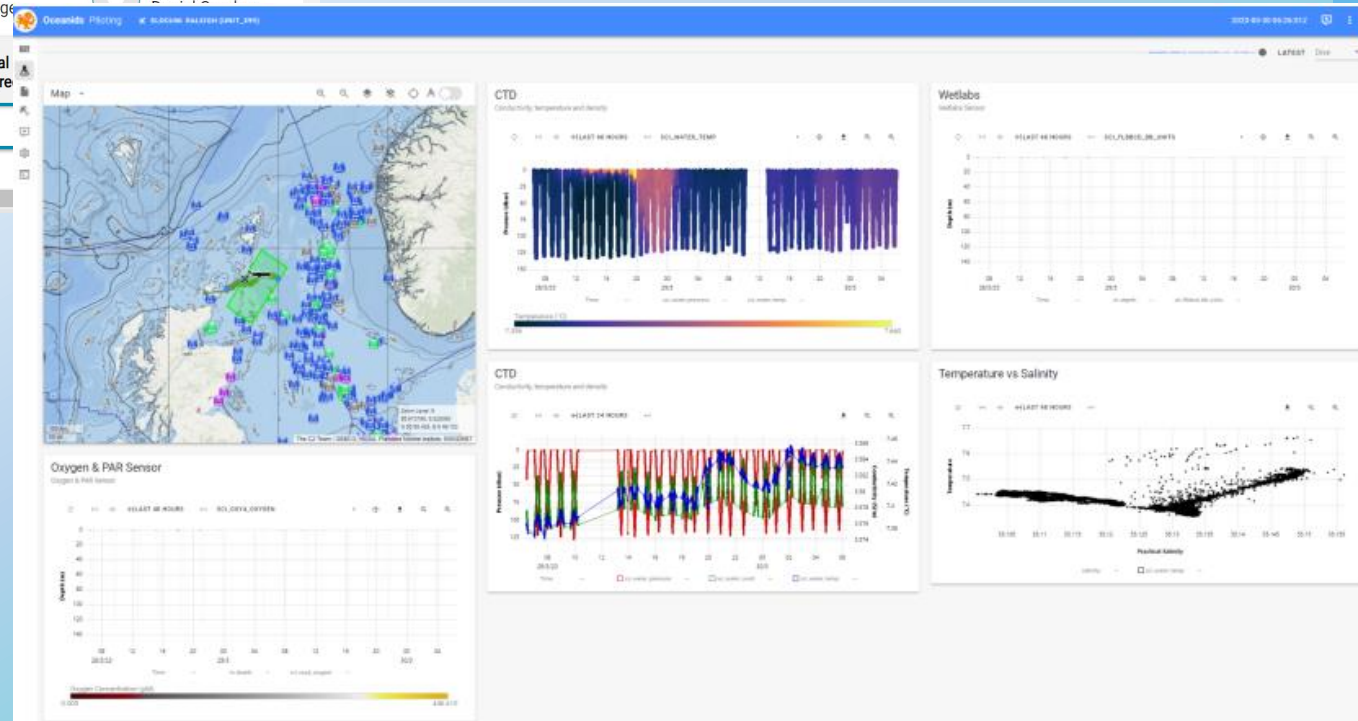
Sail: 18/06/2023 Demob (end): 06/07/2023

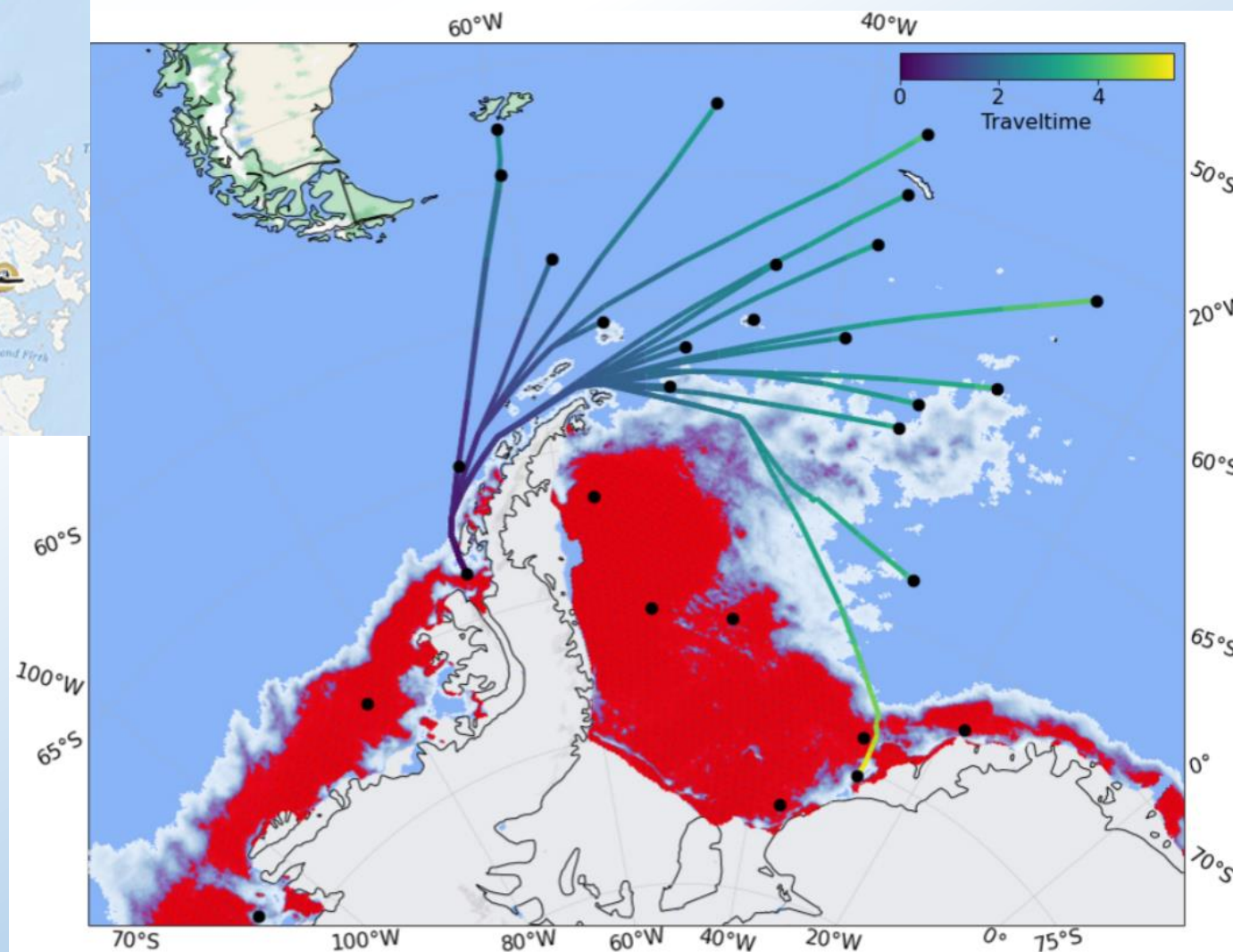
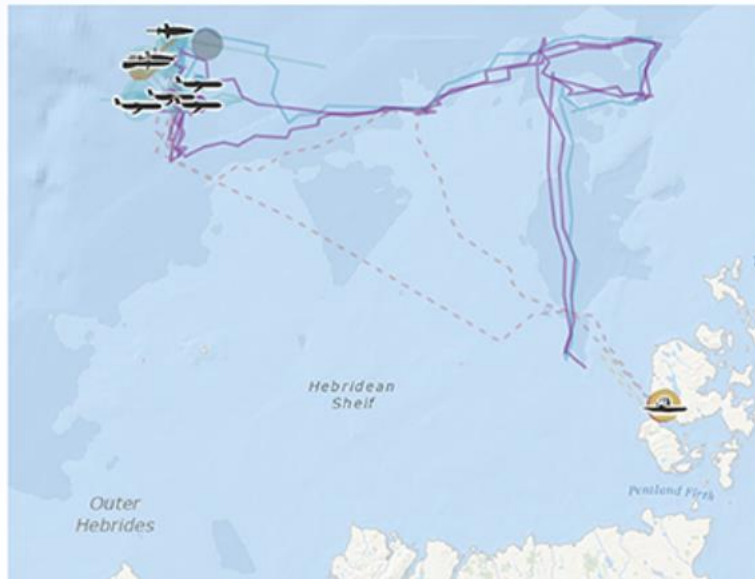
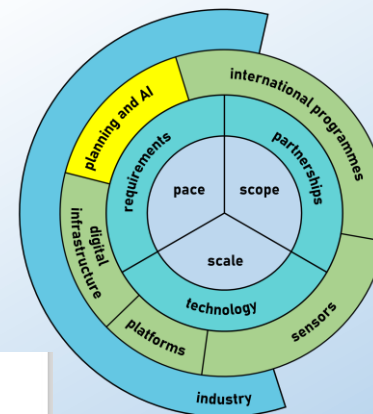
No agent specified Wainwright Bros & Co Ltd

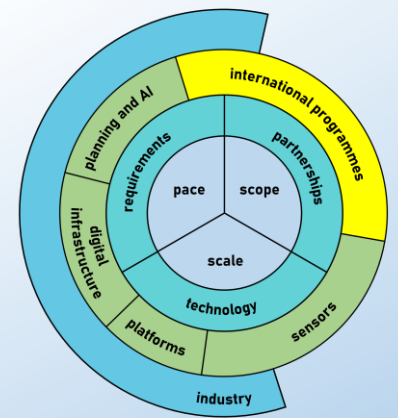
PI: Alexander Phillips Chief Scientist: Matthew Kingsland

Project Lead: Helen Oldridge Project Manager: [Name]

Application Form Final Agree Form





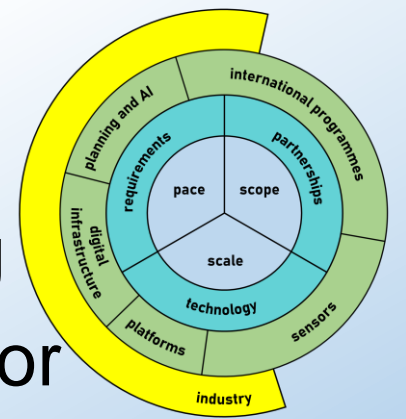


- Internationally agreed strategies/priorities for sustained obs (GOOS, WIGOS)
- Research priorities - key knowledge gaps requiring better process understanding (UN Ocean Decade, WCRP, Future Earth,)
- Strengthened observation infrastructure sharing and collaboration (OceanOps, also groups such as Ocean Facilities Exchange Group)
- Sensor development - Priorities, standards and best practices; coordinated development and scale up (Ocean Best Practices Project)
- Data sharing and data infrastructure (ODIS, WIS 2.0, Ocean Decade Data and Information Strategy).
- Model/Observation system co-design, digital twins... (OceanPredict, UN Ocean Decade programmes (various), DCC Ocean Prediction).



# FMRI Industry

- Building research ships is often a one-off activity delivering a bespoke outcome that is then integrated into a wider fleet or partnering arrangement.
- Autonomous systems present a very different scenario upon which funders and operators might develop procurement strategies:
  - Shorter equipment life-cycles
  - Identical platforms with standardised sensor fits
  - Share R&D investment/risk
  - Rapid trial of new technologies





Contact the team: [fmri@noc.ac.uk](mailto:fmri@noc.ac.uk)

[www.fmri.ac.uk](http://www.fmri.ac.uk)

X [@fmri\\_nerc](https://twitter.com/fmri_nerc)