



Department
for Environment
Food & Rural Affairs

Marine integrated autonomous observing systems

Announcement of Opportunity

Issued on 27 May 2016

Full Proposals deadline: 16.00 BST on 28 July 2016

1 Summary

Proposals are invited for a new Research Programme on improving understanding of shelf sea ecosystem function using integrated autonomous observing systems. This programme is co-funded by the Department for Environment, Food and Rural Affairs (Defra) and the WWF-UK and supported by in-kind contributions from Cefas, Dstl and the Met Office.

This Research Programme will address the scientific and technological challenges of using new technologies to deliver a more efficient and integrated next-generation UK marine observing programme, capable of meeting science and policy data requirements now and into the future.

It is expected that this announcement will lead to the funding of two projects, one to address each of the programme's two challenges. Up to £3.6m is available for this call to fund two research projects, with a maximum cost to the funders of each project being £1.8m.

Proposals for this call are invited from eligible UK researchers (see [NERC Grants Handbook](#) for standard eligibility criteria) including, for this programme, researchers at Cefas.

The closing date for full proposals is 16:00 on 28 July 2016

2 Background

Better integration of new and emerging marine technologies (autonomous platforms, miniaturised sensors, remote or automated data collection methods) provide opportunities

to deliver transformational improvements in the temporal and spatial coverage of marine observations for both scientific and monitoring purposes. Over recent years the marine community has seen investment from RCUK, Higher Education and industry of over £100 million in Smart and Autonomous Observing Systems. Marine autonomous vehicles are now routinely deployed to support NERC science, and are increasingly demonstrating their capability for complex multiple deployments with novel sensors¹ and high-quality targeted observations to improve our scientific understanding of nutrient and carbon cycling within the shelf seas². It is clear that these technologies offer the potential for observing the marine environment in cost-effective ways over large areas and for extended sampling periods.

The UK is required to fulfil statutory obligations for monitoring the state of the seas, e.g. as demanded by the Marine Strategy Framework Directive (MSFD)³, the Convention on Biological Diversity⁴ and the OSPAR Convention⁵. There is therefore an ongoing and important requirement for collection of data that enable assessment of the status of marine ecosystems and the effective management of Marine Protected Areas (MPAs). Autonomous technologies have the capability to improve the cost-effectiveness of the marine observing effort which will accelerate our understanding of marine ecosystem function and its response to climate change and other pressures. To achieve these benefits, more research is needed to prove how their capabilities can be used and integrated with existing techniques.

Marine ecosystem services were valued at \$50 trillion in 2011⁶. It is thought that over two-thirds of the overall economic value of the ocean is produced by assets that rely directly on healthy ocean conditions⁷. Model studies reported in the most recent Assessment Report^{8 9} of the Intergovernmental Panel on Climate Change (IPCC) predict adverse impacts on marine ecosystems and cascading consequences to human populations that are reliant on ocean productivity. It is crucial then that we develop a more complete understanding of the marine ecosystem response to natural and anthropogenic variability that will enable the development of better management strategies for human impacts on the marine ecosystem. Understanding the long-term resilience of the marine system to climate change, so that mankind can sustain and increase ecosystem benefits, is a high-level priority of the UK Marine Science strategy¹⁰.

Integrating new technologies within the existing marine observing infrastructure and data archives is a significant challenge. This programme will integrate and build on previous and planned NERC and co-funded projects (e.g. Shelf Seas Biogeochemistry and Marine

¹ <http://projects.noc.ac.uk/exploring-ocean-fronts/>

² <http://www.nerc.ac.uk/research/funded/programmes/shelfsea/>

³ <http://jncc.defra.gov.uk/page-5193>

⁴ <https://www.cbd.int/>

⁵ <http://www.ospar.org/>

⁶ Costanza et al. (2011)

⁷ <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-Report-Reviving-the-Ocean-Economy-Summary.pdf>

⁸ Mora C, Wei C-L, Rollo A, Amaro T, Baco AR, et al. (2013) Biotic and Human Vulnerability to Projected Changes in Ocean Biogeochemistry over the 21st Century. PLoS Biol 11(10): e1001682. doi:10.1371/journal.pbio.1001682

⁹ http://ipcc-wg2.gov/AR5/images/uploads/WG2AR5_SPM_FINAL.pdf

¹⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/183310/mscc-strategy.pdf

Ecosystem Research programmes) to advance our understanding of marine ecosystem function. Bringing observations from multiple sources together with models more effectively is essential to assess how different stressors (natural or anthropogenic) can differentially affect diverse habitats over various timescales, and what impact these stressors have upon ecosystem services.

The programme will draw upon existing fixed platforms and observing systems in European shelf waters, such as the [Cefas](#) SmartBuoy network, Met Office moored buoys, the PML [NEODAAS](#) hub, and it will take advantage of the UK fleet of marine vehicles (at the NOC-hosted Marine Autonomous and Robotic Systems facility and at higher education institutions). Successful proposals will signpost and, wherever possible, demonstrate the transferability of techniques and approaches so that they may be applied globally, including to those areas of the world with limited marine science infrastructure but where changes in marine ecosystem function directly impact large coastal populations (especially those areas eligible for official development assistance).

3 Scope of Call

3.1 Programme Objectives

The overarching objective of this research programme is to accelerate the use of autonomous measurements and combined observational-model outputs in meeting long-term science need and statutory policy requirements.

This programme will combine recent capital investment in novel marine technologies and a world-class research base in marine observing and modelling, in order to generate data to tackle topical science challenges and urgent policy drivers. The results will help improve our understanding of the marine ecosystem by taking the use of novel marine observing technology beyond proof of concept to proof of delivery. This programme will place the UK at the forefront of shelf seas research and management on a global scale, will provide benefit to other marine end-users, and through knowledge transfer will enable wider application to other regions and economies.

This programme will help deliver a more ambitious and integrated marine observational network that provides the best platforms for new sensor technologies, and ways to optimise the use of the UK's high-cost marine observing capability. It will quantify the set of variables amenable to sustained observing and at what spatial and temporal resolution, and the comparative cost of such sustained observations compared to current methodologies. The research will accelerate the use of both autonomous measurements and combined observational-model data in meeting statutory requirements for Good Environmental Status and other desired outcomes for the marine environment. The results will indicate clearly the priority actions needed to advance the use of autonomous measurement of all trophic levels.

The work undertaken will strengthen the strategic relationships between government Agencies and the marine research community, which will significantly improve the delivery of the UK Integrated Marine Observing Network (UK-IMON), the UK Marine Monitoring and Assessment Strategy (UKMMAS) and other objectives of the UK Marine Science

Coordination Committee (MSCC). The project results will feed into relevant data centres and the Marine Environmental Data and Information Network (MEDIN) and also international data infrastructures provided by the International Council for the Exploration of the Sea (ICES) and the European Marine Observation and Data Network (EMODNet), thus laying down methods for the flow and retrieval of both real-time and archival data from a new generation of marine observing technologies.

3.2 Programme Challenges

The objectives of the programme will be addressed through the delivery of two key research challenges:

Challenge 1: Demonstrate the capability of new marine observation technologies to improve our knowledge of critical feedback mechanisms between physical, biogeochemical and ecological processes.

This challenge requires observations over multiple timescales (and should include a convincing demonstration of how to obtain consistent observations over decades), multiple variables and over a wide scale of abiotic and biotic (from physics to fish) levels. Proposals could consider any of the following: improved determination of the fluxes of material across critical boundaries (e.g. shelf break, land-ocean) and their role in driving ecosystem variability; improved understanding of spatio-temporal processes controlling productivity over annual and inter-annual timescales; better understanding of the role of fronts and other sub-mesoscale hotspots in determining the distribution of migratory species and biodiversity; improving the description of connections between pelagic and benthic ecosystems; refined knowledge of the carbon cycle from surface to seabed; coastal environments where habitats and ecosystems are most at risk from anthropogenic influence, particularly over short timescales. Proposals will highlight the importance of sustained observations in the chosen area and will quantify the improvements that autonomous measurements bring.

Challenge 2: Combining marine observations from multiple sources and numerical models in order to more effectively predict and monitor the status of the shelf sea ecosystem.

Addressing this challenge will demonstrate how to combine models and observations to improve the evidence base for compliance with European directives (e.g. accurate description of spatial and temporal variability of dissolved oxygen minima in bottom waters; regional scale estimates of primary production). Proposals will focus on optimising observations using a mixture of technologies to provide real-time data as required and facilitate data assimilation for the initialisation of models, thus improving our ability to make predictions from days to decades. A key goal is the design of a cost-effective and fit for purpose observing network through a combination of autonomous technologies (gliders and surface vehicles), other observations (leading to improved calibration strategies) and shelf-wide numerical models to provide improved analysis of key ocean variables. This challenge could include predicting and observing the timing of key episodic events (e.g. the onset of phytoplankton blooms, harmful algal blooms, oxygen depletion events) as well as the integration of parameters that are not currently included in models (e.g. noise, marine litter).

3.3 Proposal Requirements

Proposals should address either Challenge 1 or Challenge 2. Proposals need to clearly demonstrate how they will deliver the programme's objectives as this will form part of proposal assessment.

Proposals are strongly encouraged to draw upon existing fixed platforms and observing systems in European shelf waters and to take advantage of the autonomous vehicle fleet at the NOC-hosted Marine Autonomous and Robotic Systems (MARS) facility, but may also use other facilities in research organisations, higher education institutions, government agencies and/or industry.

Applicants planning on utilising the MARS autonomous vehicles as part of their proposal should contact [David White](#) at MARS as early as possible to discuss their requirements and obtain costs for usage to be included within the total funding available for proposals.

Proposals containing a modelling element would be expected to utilise existing modelling platforms (see [NC modelling capabilities](#)). Whilst observations will take place on the European shelf in order to achieve synergies with the existing infrastructure, successful proposals will demonstrate the transferability of techniques and approaches to observe the health of the seas globally.

Proposals are encouraged to consider the deployment and recover of autonomous vehicles from land and/or using coastal vessels, rather than relying on the use of NERC's ocean-going research ships.

Associated studentships may not be included in proposals.

3.4 Programme Funding

Up to £3.6m is available for this call to fund two research proposals one to address each of the programme's two challenges, with a maximum cost to the funders of £1.8m for each proposal.

All costs associated with proposals must be covered by the funding available, including cost of autonomous vehicle usage. No additional funding will be available to cover any additional costs (e.g. Service & Facilities and ship costs), **with the exception MARS facility usage where NERC will pay the additional 20%.**

Proposals should present a work plan for up to 36 months.

All grants will be required to start and to have returned their starting certificate by **2 May 2017**. Please note that as a result of this requirement, the normal three month start period rules (outlined in RCUK Terms and Conditions GC4) do not apply in this instance.

The funders funding contribution will be 80% of FEC, with the exception of MARS facility usage where the funders contribution will be 100%. Indexation at the prevailing rate will be applied at the time of award.

If a proposal is of particular interest to Dstl and/or the Met Office, there is the possibility of additional funding being offered by these organisations to projects to enhance the programme of work.

4 Programme Requirements

4.1 Implementation and Delivery

All proposals are required to involve a minimum of 3 eligible institutions. Proposals will also be expected to include a range of both senior and early career scientists.

Proposals may be up to 36 months in duration and will be required to start and to have returned their Start confirmation by 2 May 2017.

All proposals must include milestones and deliverables to ensure that the programmes funders can monitor the delivery of the science outputs.

It is highly desirable for proposal teams to be inter-disciplinary and project partnership is strongly encouraged with both UK agencies (e.g. AFBI, Marine Scotland, Cefas, Met Office, EA etc.) and SME's where appropriate.

4.2 Knowledge Exchange and Impact

Knowledge exchange (KE) is vital to ensure that environmental research has wide benefits for society, and should be an integral part of any research.

All proposals will be required to identify their KE plan through a 'Pathways to Impact' section, with associated delivery costs. The KE plan will identify those who may benefit from or make use of the research (see Programme Objectives), how they might benefit or make use of the research, and methods for disseminating data, knowledge and skills in the most effective and appropriate manner.

4.3 Data Management

The NERC Data Policy must be adhered to, and an outline data management plan produced as part of proposal development. Applicants are advised to contact the relevant data centre to discuss their requirements. NERC will pay the data centre directly on behalf of the programme for archival and curation services, but applicants should ensure that they request sufficient resource to cover preparation of data for archiving by the research team.

4.4 NERC Facilities

Prior to submitting a proposal, applicants wishing to use a NERC service or facility must contact the facility to seek agreement that they could provide the service required. A technical assessment must be obtained from the facility and included with the proposal submission. Further information on [NERC services and facilities](#) can be found on the NERC website. All costs associated with the use of any NERC service or facility must be included within the cost of the proposals £1.8m budget, no additional funding will be made available to cover these costs.

4.5 Programme Management

A Programme Management team (PMT), consisting of representatives from NERC and Defra together with the successful PIs will be formed after awards are made. Additional funding will be provided to the successful proposal teams for the arrangement of PMT and science meetings, the timing and location of which will be determined by the programme funders. The cost of internal project management meetings should be covered by project budgets.

The formation of any programme advisory body will be at the discretion of and implemented by the funders.

5 Eligibility

This opportunity is open to individuals and organisations eligible for NERC research grant funding, i.e. applicants based in UK Higher Education Institutions (HEIs), NERC Research & Collaborative Centres (please refer to the [NERC Grants Handbook](#) for details), and Independent Research Organisations (IROs) approved by NERC for managed mode ([RCUK eligibility for Research Council funding](#)), including, for this programme, researchers from Cefas.

Potential applicants should contact NERC well in advance of the submission deadline if they have any queries concerning their eligibility. Individuals are limited to involvement in no more than two proposals submitted to this call; only one of these may be as the lead Principal Investigator.

6 Application Process

Full Proposals

Closing date: 28 July 2016

Full proposal must be submitted using the Research Councils' Joint Electronic Submission system (Je-S). Applicants should select Proposal Type - 'Standard Proposal' and then select the Scheme – 'Directed' and the Call – 'Autonomous observing'.

Applicants must ensure that their proposal is received by NERC by 4pm on the closing date. Applicants should leave enough time for their proposal to pass through their organisation's Je-S submission route before this date. Any proposal that is received after the closing date, is incomplete, or does not meet NERC's eligibility criteria or follow NERC's submission rules (see [NERC Grants Handbook](#)), will be returned to the applicant and will not be considered.

All attachments submitted through the Je-S system, including the Case for Support (and embedded references), should be completed in single-spaced typescript of minimum font size 11 point Arial font or other sans serif typeface of equivalent size to Arial 11, with margins of at least 2 cm. Please note that Times New Roman, Arial narrow and Calibri are not allowable font types as they are smaller and any proposal which has used either of these font types within their submission will be rejected. Applicants referring to websites should note that referees may choose not to use them.

Applicants should ensure that their proposal conforms to all eligibility and submission rules, otherwise their proposal may be rejected without peer review. More details on NERC's submission rules can be found in the [NERC research grant and fellowships handbook](#) and in the [submission rules](#) on the NERC website.

The **lead** component of each proposal should include the documents detailed below.

- i. **Case for Support**, which is comprised of three parts:

Part A – a common **Previous Track Record** (up to **3 sides of A4** in total for all Research Organisations)

The Previous Track Record should:

- provide a summary of the results and conclusions of recent work in the technological/scientific area that is covered by the research proposal, including reference to both NERC and non-NERC funded work and details of any relevant past collaborative work with other beneficiaries should also be given;
- indicate where your previous work has contributed to the UK's competitiveness or to improving the quality of life;
- outline the specific expertise available for the research at the host organisation and that of any associated organisations and beneficiaries.

Part B – a common **Description of the Proposed Research**.

This must not exceed **16 sides A4** (including all necessary tables, figures and references) and should address the following points:

- underlying rationale, scientific and technological issues to be addressed;
- relationship to programme objectives;

- relationship to other NERC research programmes;
- description of the proposed research – please describe why the work is strategically important, the key research objectives and how these will be achieved; and
- description of any proposed international collaboration.

Part C - a description of the Proposed Management Structure and plans, participant responsibilities, and scheduling chart (up to **2 sides A4**).

- ii. A common **Justification of Resources** of up to **4 sides A4** for all Research Organisations involved, for all Directly Incurred Costs, Investigator effort, use of pool staff resources, any access to shared facilities and equipment and requests for capital costs between £10,000 and the RCUK Equipment threshold, being sought. For further information of what to include in the Justification of Resources, see section F in the [NERC Grants Handbook](#).
- iii. **An outline Data Management Plan (up to 1 side A4)**
- iv. **A Pathways to Impact Plan (up to 2 sides A4)**, detailing:
 - those who may benefit or make use of the research;
 - how they might benefit and/or make use of the research;
 - what will be done during and after the project to increase the likelihood of the research reaching the identified beneficiaries and maximise the likelihood of the identified benefits being achieved
 - suggestions for impact activities that could be delivered at a programme level.

Any costs associated with project-level activities in the Pathways to Impact plan should be integrated into the proposal costings and be justified in the Justification of Resources section. The suggestions for programme-level activities should be accompanied by cost estimates, if appropriate, but not integrated into the proposal.

Letters of Support from named Project Partners only to confirm that support and facilities will be made available for associated collaborations and co-funding (up to **2 sides A4** each).

Each **component** proposal (including the lead) will additionally require the following attachments:

- v. A CV of up to 2 sides of A4 for each named PI, Co-I, research staff post and Visiting Researcher.
- vi. Application forms for access to NERC Services and Facilities, if applicable.
- vii. Price quotations for equipment costing more than £25k, if applicable
- viii. A Business Case of up to 2 sides A4 per item, for items of equipment above the RCUK Equipment threshold, if applicable. Further guidance regarding capital equipment costs may be found in the [NERC Grants Handbook](#).

Please note that on submission to council ALL non PDF documents are converted to PDF, the use of non-standard fonts may result in errors or font conversion, which could affect the overall length of the document.

Additionally where non-standard fonts are present, and even if the converted PDF document may look unaffected in the Je-S System, when it is imported into the Research Councils Grants System some information may be removed. We therefore recommend that where a document contains any non-standard fonts (scientific notation, diagrams etc), the document should be converted to PDF prior to attaching it to the proposal”

7 Assessment Process

Proposals will be internationally peer-reviewed and final funding recommendations made by a moderating panel consisting of independent experts and members of the NERC Peer Review College where possible. Applicants will be given the opportunity to provide a written response to peer review comments prior to the moderating panel. Applicants may be invited to give a presentation at the moderating panel.

The assessment criteria to be used for the full proposal stage will be as follows:

- Research Excellence
- Fit to Programme Requirements

Feedback will be provided on proposals unsuccessful at the full proposal stage.

8 Timetable

Closing date for full proposals: 28 July 2016

Decision communicated to applicants: January 2016

Projects are required to commence no later than 2 May 2017.

9 Contact

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