| **AO Title/Call Name** |  
| --- | --- |
| **Closing date** | 06 May 2020 |
| **Funding available** | £375k |
| **Funding mode/stream** | Partnerships and Opportunities |
| **NERC Core or UKRI/Collective Fund budget** | NERC Core |
| **Project duration** | Up to three years |
| **Funding partners (if applicable)** | UK Space Agency |
| **Start date requirements (if applicable)** | Latest start date 1 August 2020 |
| **Call aims and objectives** | A ground based survey using a range of pre-launch tasks including monitoring network installation, ground/water based surveys at various times to capture tidal and discharge states etc, and measurement of water flow and quality will be required (e.g. water height dynamics, discharge and velocity fields, temp and turbidity). |
| **Eligibility criteria** | Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead Principal Investigator. |
| **Call specific requirements** | Applicants should outline in their proposal the process they will use to make data available to the wider estuarine community and should outline how they will make use of the data both in an academic and non-academic context. Projects will be expected to be collaborations of partners with relevant EO, cal/val, estuarine and management/policy partnerships, and will need to demonstrate the relevant capability, tools or methodologies to deliver the required activity. Partners will also be required to build strong relationships with SWOT mission partners within NASA and CNES, which may involve representing the UK at the Science Team meetings. |
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Developing a systems approach to estuarine management using the data intense phase of the Surface Water and Ocean Topography (SWOT) satellite calibration and validation (cal/val) to understand water flows

Announcement of Opportunity

Issued on: 11 February 2020
Full Proposals deadline: 4pm on 6 May 2020

1. Summary

The Natural Environment Research Council (NERC) and the UK Space Agency (UKSA) are inviting research proposals to develop a systems approach to estuarine management using the data intense phase of the Surface Water and Ocean Topography (SWOT) satellite calibration / validation (cal/val) to understand water flows.

The SWOT mission aims to make the first global survey of the Earth's surface water, to observe the fine details of the ocean surface topography, and to measure how terrestrial surface water bodies change over time. The cal/val phase offers a unique opportunity to sample the Severn Estuary at fast time sampling (1 day) in addition to swath altimetry providing observations of water-surface elevation, slope, inundation extent, and discharge.

NERC and UKSA will provide up to £375k of funding (at 80% FEC) to eligible researchers. It is expected that one project proposal lasting up to three years will be funded and focused on the cal/val phase of the mission. The successful project must start by 1 August 2020.

Should the SWOT satellite launch be unsuccessful or delayed NERC and UKSA will work with the funded project team to review the viability of the project deliverables and agree how to manage the remainder of the project.

2. Background

The SWOT satellite mission is a ~1Bn US$ programme funded by NASA, CNES, the Canadian Space Agency and the UKSA. Launch is scheduled for September 2021, after which SWOT will make the first global survey of Earth's surface water, provide fine resolution detail of ocean surface topography, and measure lake and river changes over time. Current altimetry satellites, such as the Jason/TOPEX-Poseidon class of instruments, track water heights along a line, with tracks spaced ~120km apart. SWOT, as a scanning instrument, will map grids of water height with ~1km resolution, and as such will deliver over 100 times the resolution of current technologies. Instruments will measure water surface elevation to <10 cm Root Mean Square Error (RMSE) when averaged over 1 km². This will allow scientists to study small-scale features that are key components of how heat and carbon are exchanged between the ocean and atmosphere. Amongst numerous outcomes,
measurements will revolutionize our understanding of the global water cycle and our knowledge of the impact of mesoscale eddies on ocean and coastal dynamics.

SWOT capabilities will enable measurement of water level spatial variability along estuaries including during low tide and low flow. It will provide a better understanding of small-scale currents and eddies important to impacts on coastal and estuarine regions such as navigation, erosion and dispersing pollutants. Estuarine tidal flux is subject to strong asymmetry and non-stationarity, making it a complex challenge for precision modelling and understanding of tidal signals. This is true of many estuaries, but with the large tidal variation in the Severn, the situation is more complex than most.

This call is focussed on the cal/val phase of the mission as it offers a unique opportunity to sample the Severn Estuary at fast time sampling (1 day) in addition to swath altimetry providing observations of water-surface elevation, slope, inundation extent, and discharge.

The UK coast is a complex system of natural and human interactions, where the flow of goods and services affect hydrological, geological, and ecological processes. Estuaries and channels such as the Severn at Bristol are locations of intense and damaging interactions. For example, all UK shipborne imports have to cross through, and arrive in, the coastal zone, as does much passenger traffic. Coasts are key fishing zones, and estuaries with strong mixing/flushing have an important role in dispersing pollutants. All nuclear power stations are coastal and rely on cooling water, the discharge and dispersion of which cannot exceed particular temperature limits. Our use of the coast and Severn Estuary in particular is much broader, such as UK aquaculture, carbon storage, flood management, and cultural resources. Effective and sustainable delivery of these economic activities depend on the physical and biotic functioning of the coastal/estuarine zone.

Estuaries are high energy, dynamic environments, and among the most productive ecosystems on the planet. They are the regulatory points for water flow and mass (including, nutrient, carbon, and salt), and the filtration of pollutants and contaminants between land and oceans. To safeguard both ecosystem productivity and economic activities, a better understanding of this hydrological, geological, and ecological system and its responses to the above pressures and constraints over the next century is required.

UK sea level is projected to rise between 40 to 100 cm over the next 80 years with south Wales, north-west Scotland, Yorkshire and Lincolnshire, East Anglia and the Thames Estuary particularly affected. Accompanying this will be an increase of the storm surges and river floods that are already observed in many coastal regions of the world (IPCC, 2007, 2013). Data are needed on tides, currents, storm surges, sediment transport and water quality that can provide accurate spatial surveys of hydrodynamics at different spatial and temporal scales to better understand, predict and manage estuaries as the climate and use of the area increases.

SWOT will provide essential data on the spatial and temporal variability of the estuarine surface water elevations. During the cal/val phase the Severn is the only estuary globally to be sampled, this phase is therefore ideally suited to the level and detail of measurements required to subsequently model hydrodynamic processes in the Severn estuary, and thereby enable prediction and management needs.
3. Scope

3.1 Programme objectives

Approximately 3 months after launch in September 2021 and following the instrument checkout, the SWOT mission will enter a 3-month fast sampling phase for cal/val purposes. In this phase the orbit re-visit time will be 1 day (compared to an average of 10.5 days in the nominal orbit), and this will be achieved by only sampling a very limited number of ground tracks. One of these tracks will pass over the UK and is the only track globally to cover an estuary during the fast sampling phase. Collecting data from this site is therefore the only opportunity to capture a rich data set from a specific coastal system. With ground-based validation, data will provide a unique insight into a complex and dynamic estuarine system. The SWOT Science team has stated this UK project will be welcomed by the mission advisory group as an equal partner and will receive timely access to the data.

A ground-based survey using a range of pre-launch tasks including monitoring network installation, ground-/water-based surveys at various times to capture tidal and discharge states etc., and measurement of water flow and quality will be required (e.g. water height dynamics, discharge and velocity fields, temp and turbidity). During the 1-day fast repeat cycle of the cal/val phase, intensive ground-/water-based measurements of water-surface elevation, slope, inundation extent and discharge will be captured. Together these ground-based and satellite measurements will provide the data required to build detailed hydrodynamics models of the estuary as well as contributing to the calibrating and validating of the satellite.

There is an expectation that applicants will use the SWOT Project Calibration/Validation Plan to identify appropriate activities to include within their proposal. Applicants should refer to section 7.2.4.1 (Severn Estuary and River Validation Site (UK project site), for which the primary goal for the site is to validate SWOT’s ability to measure and characterize dynamic tidal estuaries. Characteristics to be studied include water-surface elevation, slope, inundation extent, and discharge (7.2.4.1.2). Section 7.2.4.1.3 identifies the site instrumentation available and data required, and includes low water LIDAR survey, high water bathymetric survey, and tidal gauges with the production of a 2D hydraulic model. Applicants will need to identify how they will deliver pre-launch site characterization (section 7.2.4.1.4) and post launch cal/val activities (sections 7.2.4.1.5).

3.2 Proposal requirements

Applicants should outline in their proposal the process they will use to make data available to the wider estuarine community and should outline how they will make use of the data both in an academic and non-academic context.

Projects will be expected to be collaborations of partners with relevant EO, cal/val, estuarine and management /policy partnerships, and will need to demonstrate the relevant capability, tools or methodologies to deliver the required activity. Partners will also be required to build strong relationships with SWOT mission partners within NASA and CNES, which may involve representing the UK at the Science Team meetings.

4. Programme requirements

4.1 Programme funding

The programme is a partnership between NERC and the UKSA. £375K of funding (80% FEC) is available for eligible researchers.
It is expected that one project will be funded through this call.

**4.2 Implementation and delivery**

The successful team will be expected to liaise closely with the SWOT mission teams in NASA and CNES to ensure all the plans are consistent with the mission plans. UKSA will provide contact points at the kick off.

Throughout the programme, the successful team will be required to provide a report on outputs every six months to UKSA and engage closely with UKSA before, during, and after the field campaign to promote this activity through relevant media channels. The successful team will also be required to work closely with the SWOT mission Science meetings as appropriate.

**4.3 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.

A separate Pathways to Impact statement is not required, but applicants should still consider how they will or might achieve impact outside the scientific community and include this as part of their Case for Support. Impact activities do not have to be cost-incurring, but relevant costs can be included and must be fully justified within the Justification of Resources statement.

All funded projects may also be required to engage with programme-wide KE activities, in which case appropriate funding for which will be provided by the programme.

**4.4 Data Management**

The [NERC Data Policy](https://www.nerc.ac.uk/data/policies/) must be adhered to, and an [outline data management plan](https://www.nerc.ac.uk/about/using-nerc-data/data-management/) produced as part of proposal development. NERC will pay the data centre directly on behalf of the programme for archival and curation services, but applicants should ensure they request sufficient resource to cover preparation of data for archiving by the research team.

**4.5 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. Applicants wishing to use most NERC facilities will need to submit a mandatory ‘technical assessment’ with their proposal. This technical assessment is required for aircraft but not for NERC Marine Facilities (NMF – Shiptime and/or marine equipment) and HPC. For NERC, this means a quote for the work which the facility will provide. A [full list](https://www.nerc.ac.uk/services-and-facilities/) of the Facilities requiring this quote can be found on the NERC website. The costs for the service or facility (excluding NMF and HPC costs) must be included within the Directly Incurred Other Costs section of the Je-S form and also within the facilities section of the Je-S form. Further information on [NERC services and facilities](https://www.nerc.ac.uk/services-and-facilities/) can be found on the NERC website.
4.6 Reporting requirements

As with all NERC grant holders, there will be a requirement to report through the UKRI reporting system; this is required annually and continues for up to five years post grant end.

5. Application process

5.1 How to apply

Closing Date: 6 May 2020

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 – ‘SWOT satellite cal/val’.

This call will close on Je-S at 4pm on 6 May and it will not be possible to submit to the call after this time. 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 incomplete, or does not meet NERC’s eligibility criteria or follow NERC’s submission rules (see NERC Grants Handbook), will be office rejected and will not be considered.

All attachments, with the exception of letters of support and services/facilities/equipment quotes, submitted through the Je-S system must be completed in single-spaced typescript of minimum font size 11 point (Arial or other sans serif typeface of equivalent size to Arial 11), with margins of at least 2cm. Please note that Arial narrow, Calibri and Times New Roman are not allowable font types and any proposal which has used either of these font types within their submission will be rejected. References and footnotes should also be at least 11 point font and should be in the same font type as the rest of the document. Headers and footers should not be used for references or information relating to the scientific case. 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.

Proposals for this call should be submitted in standard grant format following the requirements outlined in Section F of the NERC research grant and fellowships 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.

No associated studentships can be requested under this call.

The expected start date for projects funded under this Announcement of Opportunity is 1 August 2020.
5.2 Eligibility

Normal individual eligibility applies and is in Section C of the NERC research grant and fellowships handbook. Research Organisation eligibility rules are in Section C of the handbook.

NERC research and fellowship grants for all schemes may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs). Full details of approved RCIs and IROs can be found on the UKRI website.

IIASA Co-investigator eligibility rules apply to this call. Further details are available on the NERC website.

Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead Principal Investigator.

6. Assessment Process

Proposals will be reviewed by an Assessment Panel of international experts. Applicants will be invited to give a presentation to the panel.

The assessment criteria to be used will be as follows:

- Research Excellence
- Fit to Scheme

Feedback will be provided to both successful and unsuccessful applicants.

NERC and UKSA will use the recommendations of the assessment panel along with the overall call requirements and the available budget in making the final funding decisions.

7. Timetable

- Announcement published: 11 February 2020
- Deadline for submission of full proposals: 6 May 2020
- Assessment Panel meets: w/c 25 May 2020
- Latest start date for projects: 1 August 2020

8. Contact

For all enquiries, please contact Tom Doyle Tom.Doyle@nerc.ukri.org