

Announcement of Opportunity

Storm risk mitigation through improved prediction and impact modelling

Expert Group

(Date issued: Thursday 30th July; Closing date: Wednesday 2nd September)

Summary

1. NERC is inviting applications from individuals interested in joining an Expert Group that will refine the specifications for a Research Programme on *Storm Risk Mitigation through Improved Prediction and Impact Modelling* and support the development of an Announcement of Opportunity. This document defines the recruitment process and the role of the Expert Group. Applications expressing interest in joining the group are being invited (deadline 2nd September 2009) in the format outlined in this document.

A. Programme Background

Rationale

2. Storms have had an increasing social and economic cost over recent years and are likely to be the main cause of loss of life or assets in the UK over the next few decades. Furthermore, with climate change, the costs associated with storm impacts are likely to substantially increase. The negative societal impacts caused by adverse weather are disproportionately influenced by extremes. This has highlighted the need to improve the quality of forecasting of storm track and intensity - both in the short-term (0-48 hours) through numerical weather prediction (NWP) - and in the long-term with evolving climate change through improved climate prediction. On both timescales there is a need to improve forecasting of impacts. Several research gaps need to be filled with regard to the prediction of mid-latitude storms, particularly extra-tropical cyclones, to inform short-term mitigation strategies against the impacts of hazardous weather such as high winds, and heavy rain. Given the high degree of influence on other natural hazards - such as riverine, groundwater, pluvial and coastal flooding; ground stability (including landslides) and coastal erosion; let alone the built environment, ecosystems (e.g. coral reefs) or agriculture - there is a requirement for improved linkage with impact models to better inform policy and enable preventative measures to minimise risks associated with such storms. There is a need to optimise the way in which NWP models and climate models couple from global to regional and, ultimately, to impacts models such as those addressing storm surge.

3. This research programme is being commissioned within the context of widespread, substantial, and growing international funding for storm research, e.g. USA, EU countries, and Japan, and an essential part of the programme will be engagement with international activities. For example the WMO The Observing system Research and Predictability EXperiment (THORPEX) Programme.

4. The programme is timely because of recent progress in modelling, observations (using in-situ and remote sensing instruments) and data assimilation, and it will build upon many of the current strengths of the NERC community, e.g. research undertaken within the APPRAISE and FREE programmes and in NERC Centres..

NERC Strategy

5. The programme has been developed as part of the Natural Hazards Theme¹, and it will address the need to increase the capability to forecast the impacts of hazardous weather (in particular heavy rain, and high winds) and contribute to meeting the Natural Hazards Theme Challenge 1 - Enable better forecasting and mitigation of hydro-meteorological hazards.

¹ (see <http://www.nerc.ac.uk/research/themes/hazards/>)

6. The programme will directly address NERC Natural Hazard strategy challenges relating to storms, floods, coastal erosion, and improvement of integrated risk assessment and scientific advice. The storm challenge has the highest priority in the Natural Hazards Theme, and this programme will deliver towards strategy deliverables aimed at improving: i) predictive capability of extreme wind and precipitation; ii) knowledge about the change in the frequency and intensity of storms under global warming conditions; iii) improved knowledge of the coastal sea surface response to extreme storm conditions and how well the current generation of models deal with it.

7. It is anticipated that this Research Programme will make a significant contribution to the Living With Environmental Change programme, specifically Objectives A and D.

B. Expert Group

8. The role of the Expert Group is to support the development of an announcement of opportunity (AO), and accompanying documentation for the Storms Research Programme. This will include:

- Refinement of the specification and development of the programme's science deliverables to help ensure that the resultant applications in response to the Announcement of Opportunity will meet the programme's requirements;
- Identification of the links needed to provide effective integration between the three science deliverables;
- Clarification of the level and type of support required from NERC's facilities e.g. FAAM and HPC, and the risks that these dependencies may involve;
- Identification of specific elements that would benefit from collaborative development with LWEC partners;
- Exploration of international collaborations relevant to the programme.

9. The Expert Group membership will include representatives from the academic community and relevant stakeholders, including any co-funders and user groups. The Group will include representation from, but not be limited to, the following groups: the UK and international academic community (covering major aspects of the programme's remit), relevant government departments and development agencies, NERC research and collaborative centres, relevant industry, independent consultants.

10. The final decision on the composition of the expert group lies with NERC, and NERC reserves the right to appoint members to the group to achieve the balance of representation required.

11. Members of the Expert Group will be required to:

- Represent the broader research community and perspective, rather than their own personal interests;
- Keep discussions and documentation relating to the research programme confidential;
- Comply with the NERC policy on vested interests;
- Seek to ensure that their actions and communications can not be misconstrued by the scientific community as taking advantage of their role in the Expert Group should they apply for the resultant Announcement of Opportunity.

12. Key Milestones:

- First Meeting of the Expert Group – 17 September 2009
- Second Meeting of the Expert Group – week commencing 28 September 2009

Applicants must be available for the first date, and can not be represented by a substitute.

- Approval and publication of the Announcement of Opportunity – Q3 2009/10

C. Programme Vision

13. NERC Council approved a high level vision for the Storm Risk Mitigation Research Programme, with an allocation of £4.9 million (total cost to NERC) over 5 years.

14. The programme is expected to deliver on this vision by commissioning research and related activities the following areas:

- Three fully integrated science deliverables addressing the areas of NWP, Climate and Impacts, respectively (see below). Approximately 50% of the research effort should be allocated to Deliverable 1 and 25% each to Deliverable 2 and Deliverable 3.
 - Deliverable 1 Numerical Weather Prediction: Improve ability to predict hazardous weather associated with mid-latitude cyclonic storms in the short term (0-48hrs) by developing improved representations of core physical (convective-scale), processes and interaction [using improved observation strategies and technologies]
 - Deliverable 2 Climatic: Predict how climate change will affect the generation and evolution of mid-latitude storms [using high-resolution, weather-resolving global coupled climate models]
 - Deliverable 3 Impacts: Model vulnerability to storms (precipitation and wind) at the catchment and coastal management unit scale [using high-resolution (regional) models]
- Improvement of assimilation techniques and coupling of a defined range of NWP, climatic and impact models.
- Enhancement of our understanding of mid-latitude cyclonic storms and their impact, with a focus on the Northern hemisphere, filling key research gaps
- Assessment of new data assimilation techniques, novel, and targeted observations for usefulness and practicality using a range of idealised and real case studies
- Address user requirements (particularly in the areas of forecasting and impacts)
- Enhancement of UK leadership and international recognition in the field

The programme's three science deliverables are expected to address the following detailed requirements:

Science Deliverable 1: Numerical Weather Prediction

- Increase the physical representation of storms in models at all scales (including interaction across scales) through improved understanding of underlying physical processes. Including: synoptic scale development, mesoscale structure of cyclones, convective scale, cloud microphysics.
- Address the impact of the evolution of low- and high-latitude cyclones on mid-latitude cyclones.
- Develop and test improved assimilation techniques and work towards seamless interaction between NWP and climate models.
- Make observations, particularly of storm-scale processes e.g. using the FAAM aircraft, Chilbolton and Aberystwyth radars and LIDARs and other ground-based instruments. Incorporate new sensor networks and instruments as these become available.
- Use operational forecast products, satellite measurements and the meteorological measurements made regularly (e.g. by wind profilers) to examine phenomena of interest, including extreme events.

- Operate ongoing observation programme, with intensive field campaigns where necessary, tied closely to the modelling effort and international programmes/opportunities.
- Test very fine resolution NWP model performance against observations (e.g. extreme rainfall, surge and wave prediction important for flood frequency predictions)
- Employ a phased approach with early modelling undertaken to further define goals and strategy for observations

Science Deliverable 2: Climatic

- Improve coupling of high-resolution modelling components, and those addressing storms with climate change.
- Provide advice to environmental managers who need to predict the future impacts of storms (such as wind damage, flooding, and storm surge) in the context of a changing climate.
- Build upon modelling work done in WP1 and WP3.

Science Deliverable 3: Impacts

- Use high-resolution climate models, capable of capturing storms with sufficient detail, to feed into regional and local downscaling models required for impacts assessments.
- Focus on the next few decades
- Understand how the incidence of damaging storms is affected by inter-annual and decadal modes of variability, especially the NAO.
- Assess catchment and coastal vulnerability, for a range of scenarios, for instance during a succession of storm events.

The expert group will be responsible for reviewing, and subsequently refining the science deliverables to ensure that the programme requirements will be met.

Collaboration/International Requirements

15. The programme will be expected to:

- Involve multiple partners in the programme at all stages, including collaboration between NERC Centres and HEIs.
- Work closely with LWEC partners, as formal project partners where appropriate – especially the Met Office and Environment Agency - particularly to address challenges related to catchment and coastal impacts.
- Build on current work in the UK and internationally.
- Explore appropriate and beneficial collaboration with THORPEX, FREE, CASCADE, COPS, Global Precipitation Mission, ECMWF.
- Co-ordinate and/or collaborate with relevant computational science activities.
- Co-ordinate and/or collaborate with related actions in Climate Systems Theme, particularly the Changing Water Cycle, but also other activities (e.g. Quantifying Uncertainty, and the NERC – MetOffice Joint Research Programme).

16. The programme will be dependent on a wide range of NERC facilities (e.g. FAAM) used in conjunction with other, complementary international observing systems, and it will involve the development of new meshing strategies, exploitation of massively parallel algorithms and code optimisation – which will require the programme to work, and coordinate, with computational science activities ongoing in NERC and other communities.

17. Standard NERC policy for Knowledge Exchange, Data Management, Communication and Public Engagement, Training and Governance and Performance Management will apply.

D. Guidance for applicants to join the Expert Group

Eligibility

18. Applications from UK-based individuals - in both the public and private sectors - with relevant research backgrounds and who are able to make the necessary commitment to the Storms Research Programme are welcome.

Finances

19. NERC will cover all reasonable travel and subsistence costs incurred through expert group membership responsibilities.

Assessment criteria

20. The final choice of Group membership will be made by NERC and will be based on the following criteria (not in priority order):

- balance of representation across academic, stakeholder, international and co-funder communities;
- relevant expertise;
- cross-community knowledge,
- contacts and links;
- track record.

21. NERC reserve the right to appoint members to the Group to achieve the balance of representation required.

Assessment Timetable

22. The timetable is as follows:

- Closing date (2nd September 2009)
- Expert Group members will be invited by 11th September 2009.

Application Format

23. The application includes sections on expertise, relevance and relationship to the Storms Research Programme aims, current and past membership of professional bodies, experience of NERC operations, recent publications and qualities and value nominee would bring to the group.

24. The application will consist of completion of the application form in 12 point Times New Roman or Arial.

25. Applicants may attach a brief CV (no more than 2 sides A4) in support of their application.

How to Submit

26. Applications must be submitted as an email attachments to Sally Reid (serei@nerc.ac.uk) by 4pm on Wednesday 2nd September 2009.

Contacts

27. Initial queries should be directed to:

Sally Reid
serei@nerc.ac.uk
01793 442565