



## Job Description

This form summarises the purpose of the job and lists its key tasks. It is not a definitive list of all the tasks to be undertaken as those can be varied from time to time at the discretion of the School, in consultation with the postholder.

**Job title:** Research Officer (Nonlinear systems and climate modelling)

**Department/Centre/Institute:** Grantham Research Institute on Climate Change and the Environment  
**Accountable to:** Professor David Stainforth

### Job Summary

#### Optimising the Design of Ensembles to Support Science and Society (ODESSS)

Ensembles of climate model simulations are widely used to make projections of future climate for use in evaluating climate change impacts and for guiding efforts to build societal resilience. The ODESSS project is a new project which aims to build sound conceptual foundations for climate modelling and climate prediction experiments. It will address questions such as what is required of a climate model experiment or ensemble to be able to provide robust answers to a variety of different types of scientific and policy questions.

The project will utilise low-dimensional nonlinear systems to understand the uncertainties in model-based climate predictions, including studies of how they can be sensitive to model design, parametric uncertainties and starting conditions. It will also gather experience, perspectives and requirements from a diverse range of disciplines involved in generating and using climate predictions. Based on these two strands of information it will make recommendation regarding what is required of an ensemble of model simulations to provide reliable and useful information about future climate change.

The project will begin by approaching these questions from a conceptual view point rather than a demand view point, leading to the design of “aspirational ensembles” i.e. those ensembles we would like to have in an ideal situation without regard to computational limits. The next stage will use insights from the first but will address questions related to the best use of current computational resources for the supply of the most informative climate information to impact disciplines and wider society.

The project has five objectives:

1. Develop design criteria for aspirational climate model ensembles; these are the ensembles we would wish to run without consideration of today’s computational constraints.
2. Create a set of practical ensemble designs for climate model experiments which could be run on today or in the near future.
3. Develop test-bed demonstrations of the above design issues with low-dimensional nonlinear dynamical systems which have characteristics that reflect climate modelling. These will address issues including:
  - Quantification and separation of different types of initial condition uncertainty.
  - Quantification of the consequences of model error (structural and parametric).



- How to design perturbed parameter ensembles to achieve the most informative exploration of future possibilities in the context of driven climate change.
- How to trade off model complexity, model resolution, and ensemble size/design to achieve the most robust and useful results.

4. Bring together a national and international multi-disciplinary network of experts to understand the diverse perspectives of, and requirements on, climate model ensembles.

5. Provide recommendations for future ensembles of global climate models which are better able to support climate change adaptation initiatives and the provision of climate services.

This post holder will be involved in all aspects of the project but will be focused on (a) the development of low-dimensional nonlinear systems with the essential characteristics of climate and anthropogenic climate change, and (b) the construction and analysis of ensembles of such systems to better understand the pros and cons of different experimental designs. The position would suit either a climate-interested mathematician or a nonlinear-systems-interested climate or environmental scientist/modeller.

LSE is a world-class centre of learning, recognised for its concentration of teaching and research. From its foundation in 1895, LSE has been a place where ideas are developed, analysed, evaluated and disseminated around the globe. The 2014 Research Excellence Framework confirmed the School's position as a world-leading research university, with LSE ranked as the top university in the UK based on its production of 'world leading' (4\*) research.

### **Duties and Responsibilities**

The successful applicant will work closely with Professor David Stainforth and project partners across the UK and beyond.

### **Range of Research Activities and Responsibilities**

Specific responsibilities under the project will include:

- Research on the behaviour of nonlinear systems from the perspective of climate prediction.
- Development of a number of relevant nonlinear dynamical systems.
- Developing code to run very large ensembles of these systems.
- Analysing these ensembles and exploring the sensitivity of the results.
- Utilising software packages such as R, Matlab or IDL to both run the ensembles and analyse the outputs.
- Collaborate with colleagues on the project regarding ensemble design, writing academic papers, and designing and running multi-disciplinary workshops.
- Leading on writing and publishing academic papers and contributing to other outputs, such as Policy Briefs and Working Papers.
- Leading on organising relevant events, such as meetings and small workshops.
- Participating, as appropriate, in internal and external meetings, brainstorm sessions, technical/policy workshops, information sessions, and conferences.
- Initiating and sustaining links with external bodies to foster collaboration.
- Presenting the research at conferences.
- Presenting seminars.
- Contributing creative solutions to research challenges.



**Activities relating to administration and management and/or School service may include:**

- Playing a constructive role in the life of the Institute/Department.

All of the above subject to the contractual obligations imposed by the external funding agency and with the agreement of the grant-holder, Principal Investigator and/or Head of Centre.

**Flexibility**

To deliver services effectively, a degree of flexibility may be required in the duties performed in order to meet the exigencies of service. Job roles may also naturally develop over time and ongoing substantial changes to a role will be discussed between line managers and their staff, with job descriptions updated as and when appropriate.

**Equity, Diversity and Inclusion (EDI)**

LSE is committed to building a diverse, equitable and truly inclusive university. All posts (and post holders) will seek to ensure diversity and inclusion, while opposing all forms of unlawful and unfair discrimination on the grounds of age, disability, gender identity, marriage and civil partnership, pregnancy and maternity, race, nationality, ethnic or national origin, religion or belief, sex and sexual orientation, or social and economic background.

**Ethics Code**

Posts (and post holders) are assumed to have a responsibility to act in accordance with the School's Ethics Code and to promote the principles and values that the Code enshrines. The Ethics Code clearly states that the whole LSE community, including all staff, students, and governors of LSE, are expected to act in accordance with the principles which are set out in the Code. As such you are required to read and familiarise yourself with it. The School's Effective Behaviours Framework is designed to support this Code. It sets out examples for the six behaviours that all staff are expected to demonstrate, these can be found on the following link: [click here](#)

**Environmental Sustainability**

The post holder is required to minimise environmental impact in the performance of the role, and actively contribute to the delivery of the LSE Environmental Policy.