



The DFID-Met Office Hadley Centre Climate Science Research Partnership (CSRP)

## **CSRP Fellowships in African Climate Science**

### **CALL FOR APPLICATIONS**

African climate researchers and applied scientists are invited to apply for fellowships in African climate science. The fellowships are offered as part of the Climate Science Research Partnership (CSRP) between the Met Office Hadley Centre (MOHC) and the Department for International Development (DFID) of the UK government. The CSRP aims are to improve the understanding and prediction of African climate on monthly, seasonal and decadal timescales and to strengthen climate science capacity in Africa.

This Call for Applications is extended to climate researchers and applied climate scientists/practitioners working in the field of African climate variability and change. Three types of fellowship are available:

- Postgraduate Research Fellowships (maximum 12 months duration);
- Postdoctoral Research Fellowships (maximum 12 months duration);
- Applications Project Fellowships (maximum 6 months duration).

Maximum grant award amounts are £9000 for Postgraduate Research Fellowships, £13000 for Postdoctoral Research Fellowships and £6500 for Applications Project Fellowships. Approximately 3 fellowships of each type will be awarded. The start and end timing of the fellowships is flexible within the following constraints: no fellowship may begin before 1 May 2011, and all fellowships must end no later than 31 December 2012.

A strong preference will be given to candidates proposing a study/project that is closely aligned with one or more of 7 CSRP themes. Successful applicants will be funded to make an induction visit to the MOHC, of up to 4 weeks duration, to learn about the CSRP objectives, retrieve data for the research/project and to help consolidation of their research/project plans.

Applicants must be resident nationals of an African country.

The deadline for applications is 4 February 2011. Information on how to apply is provided in section 3. Applications will be assessed by a panel comprising representatives of MOHC and DFID. We anticipate that successful candidates will be notified by 28 February 2011.

## 1. Background on the CSRP

Full details of the CSRP objectives and workplan may be found at <http://hadobs.metoffice.com/csrp/index.html>. The top level science objectives are summarised below.

- **Improved understanding and modelling:** this objective will advance understanding of the remote and local drivers of African climate and improve their representation in the MOHC HadGEM3<sup>1</sup> climate model;
- **Improved prediction products:** under this objective, improved real-time monthly-to-decadal (i.e. up to 10 years ahead) predictions are being developed and new prediction products, better tailored to the needs of African stakeholders, are being investigated and evaluated;
- **Observational monitoring and attribution<sup>2</sup>:** under this objective near-real-time observational monitoring and attribution systems will be developed, providing advice on the contribution of man-made climate change to observed climate extremes in Africa;
- **Downscaling:** this objective will enhance the MOHC PRECIS<sup>3</sup> system and develop its use for downscaling seasonal forecasts over Africa, including potential for trial implementation at African centres.

The above research is being led by a team of scientists at the MOHC. Through the CSRP Fellowships, successful applicants will have the opportunity to use CSRP research outputs (e.g. output from the HadGEM3 model) to further their own research or applications project, interact with MOHC scientists and contribute to the overall CSRP research objectives.

## 2. Description of the fellowship types

The CSRP is awarding grants that will enable fellows to conduct research or applied project work on climate variability and change themes. The research or applications project will be of the fellow's own design, but must be tied to one or more of 7 CSRP themes described in the Appendix to this document. The grants are intended to increase the professional development of fellows and to advance the project aims of the CSRP. It is expected that the fellowships will represent the full-time occupation of the successful applicants – if this is not the case full details and appropriate adjustment of the budget must be provided in the Fellowship Proposal.

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<sup>1</sup>HadGEM3 is a development version of the Met Office Hadley Centre global coupled ocean-atmosphere General Circulation Model (GCM).

<sup>2</sup>Attribution studies seek to determine, for example, that fraction of the risk of 'extreme' climate events that may be 'attributed' to man-made climate change.

<sup>3</sup>PRECIS (Providing Regional Climates for Impact Studies) is a regional climate modelling system developed at the Met Office Hadley Centre which incorporates a regional climate model, boundary conditions from a range of GCMs, data processing, analysis and display tools backed up by a flexible and in-depth training programme.

### **Fellowship types**

Three fellowship types are available: i) Postgraduate Research Fellowships, ii) Postdoctoral Research Fellowships and iii) Applications Project Fellowships.

- i. Postgraduate Research Fellowships: will be awarded to approximately 3 candidates. Candidates must have a Bachelors (BSc) degree or expect to be awarded a Bachelors degree before the start of the proposed fellowship. Applicants already registered on a postgraduate research programme may use the fellowship to conduct research on a CSRP theme related to their programme, either at their Home Institute or as a Visiting Fellow (see below) at another African institute. The fellowship research proposed should be designed to be a self-contained module, with well defined objectives, within the overall theme of the student's research dissertation/thesis. Postgraduate Research Fellowships will last for 12 months or less.
- ii. Postdoctoral Research Fellowships: will be awarded to approximately 3 candidates. Candidates must have a PhD degree in the field of climate variability and change, or expect to be awarded a PhD degree before the start of the proposed fellowship. Awards may be used to assist fellows gain a temporary postdoctoral position at an African institute. The research programme must have well-defined objectives and be sufficiently focussed to advance understanding on a recognised long-standing 'problem'. Postdoctoral Research Fellowships will last for 12 months or less.
- iii. Applications Project Fellowships: will be awarded to approximately 3 candidates with at least a Bachelors (BSc) degree and substantial experience working in the field of climate prediction/applications. Fellows will receive an award that will enable them to conduct a project aimed at bringing climate prediction research into use. Projects may include, for example, bringing new observational data or prediction methodology into use for climate services and/or working with users in an applications sector (e.g. agriculture, water resource, health, disaster risk management) to develop new 'user-tailored' products. Applications Project Fellowships will last for 6 months or less.

### **Home and Host Institutes, Visiting Fellowships, User Organisation**

Successful candidates may conduct the research or project work at the African institute where they are currently registered or appointed (the 'Home Institute') or in whole or in part as a 'Visiting Fellow' at another African institute (the 'Host Institute'). Visiting Fellowships must be arranged by, and agreed between, the Home and Host Institutes in advance of submission of the application. If the fellowship is to be conducted at the Home Institute, the Home Institute is also the Host Institute for purposes of the application (and both Endorsement Forms (see section 3) must be submitted by the Home Institute). Note also that if the fellowship is to be conducted at the Home Institute a clear gap in existing funding to support the proposed research/project must be demonstrated.

Candidates applying for an Applications Project Fellowship (limited to themes 4 to 7) or for a Postgraduate or Postdoctoral Research Fellowship on themes 4 or 5 must engage at least one User Organisation in their research or project. The role of the User Organisation is to facilitate effective applications work by providing (free of charge) information on, for

example, requirements for climate predictions/observations and feedback on research outputs and/or trial prediction products.

### **3. How to apply**

The following documents must be submitted to the CSRP Fellowship Coordinator on or before the 4 February 2011.

1. Fellowship Proposal (to be submitted by the candidate)
2. Copy of BSc or PhD certificate as appropriate, if already awarded (to be submitted by the candidate)
3. Host Institute Endorsement Form (to be submitted by the Host Institute)<sup>1</sup>
4. Home Institute Endorsement Form (to be submitted by the Home Institute)<sup>1</sup>
5. User Organisation Endorsement Form (to be submitted by the User Organisation<sup>2</sup> – required for all Applications Project Fellowships; only required for Postgraduate or Postdoctoral Fellowships if CSRP themes 4 or 5 are selected)
6. Two (2) professional reference forms (to be submitted by the referees)

All document templates required for application may be downloaded from the CSRP website at <http://hadobs.metoffice.com/csrp/index.html>.

The Fellowship Proposal includes sections on: candidate information, statement of candidate suitability, research/project proposal, budget (breakdown of fellowship costs). Candidates should write the Fellowship Proposal in liaison with the Host Institute. The Fellowship Proposal should not be submitted without approval of the Host and Home Institutes.

It is the responsibility of the applicant to coordinate all submissions and to ensure all required documents are completed and submitted by the application deadline. All completed documents should be submitted by email and attachment to the CSRP Fellowship Coordinator at [csrpfellowship-coord@metoffice.gov.uk](mailto:csrpfellowship-coord@metoffice.gov.uk).

### **4. Evaluation of applications**

All applications will be evaluated by the CSRP Fellowship assessment panel. All applicants must meet the following general eligibility criteria that are applicable to all fellowship types:

All applicants must:

1. be a resident national of an African country.

In addition:

2. All required application documents (Section 3) must be received on or before the application deadline;

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<sup>1</sup> If the proposed fellowship is to be conducted at the Home Institute, the Home Institute must submit both the Home Institute and Host Institute Endorsement Forms.

<sup>2</sup> Either the Home or the Host Institute may also be named as the User Organisation if they are users of climate information of the type that will be the subject of the proposed research/project.

3. Applications must be endorsed by the Host Institute and Home Institute and, where required, by the User Organisation;
4. The budget must not exceed the maximum award for the fellowship type applied for.

The applicant must also satisfy the essential qualifications and skills of the candidate profile for the fellowship type applied for, as listed below. The candidate must provide full evidence in the relevant section of the Fellowship Proposal.

**Essential qualifications and skills:**

Postgraduate Research Fellows

- a) At least a Bachelors (BSc) degree in physics, mathematics, meteorology or atmospheric sciences (or expected to graduate before the start of the proposed fellowship).
- b) A good general understanding of climate science.
- c) Sufficient experience with computer software packages to be able to effectively manipulate and analyse data.
- d) A good working knowledge of spoken and written English.

Postdoctoral Research Fellows

- a) A PhD degree in the field of climate science (or expect to be awarded a PhD before the start of the proposed fellowship).
- b) A strong understanding of the CSRP theme selected for study, or closely related subject.
- c) Proven effectiveness in computer programming and use of software packages for manipulation and analysis of climate model output and/or observational datasets.
- d) A good working knowledge of spoken and written English.

Applications Project Fellows

- a) At least a Bachelors degree in physics, mathematics, meteorology, atmospheric sciences, or a related science or discipline associated with the application of climate information.
- b) Good experience of developing and supplying climate predictions, and/or monitoring products and/or applications products (e.g. through work at or in affiliation with a National Meteorological Service, regional centre, Regional Climate Outlook Forum, or other organisation/activity).
- c) Good experience with software packages for manipulation and analysis of climate model output and/or observational datasets and for generating graphical products.
- d) A good working knowledge of spoken and written English.

Applications which pass the above requirements will go forward to assessment of the Fellowship Proposal. Weightings are given to some sections of the Fellowship Proposal to assist the panel in assessment of proposals, and these are provided in the Fellowship Proposal Form. In case of tied marking, evidence for other candidate attributes that are desirable (but not essential) will be sought. These are listed below for the different fellowship types.

**Desired experience/skills:**

*All Fellows*

- a) Previous research experience in analysing dynamical model and observational data to study climate variability and change.
- b) Previous research or other experience in the general area of the study theme selected (e.g. ensemble prediction methods and probabilistic forecasting, downscaling (including use of PRECIS), model assessment and verification, observational analysis)

*Postgraduate Research Fellows*

- a) Undergraduate coursework or dissertation in a field aligned to the CSRP theme selected for the Fellowship Proposal

*Postdoctoral Research Fellows*

- a) PhD thesis on a subject closely aligned to the CSRP theme selected for the Fellowship Proposal
- b) Published papers on topics closely aligned to the CSRP theme selected for the Fellowship Proposal

*Applications Project Fellows*

- a) Undergraduate coursework or dissertation, publications or other work in a field closely related to the applications project proposed
- b) Previous experience in generating and supplying climate prediction products and assisting in the communication/interpretation of products to users.

In addition to assessment of the Fellowship Proposal and the candidate attributes, the assessment panel will also give consideration to the following:

- the appropriateness of the cost and purpose of budgeted items;
- the resources of the Host Institute;
- that fellowships awarded achieve good coverage over the 7 CSRP themes;
- that fellowships awarded achieve good geographic coverage across Africa;
- that a gender balance is achieved among the selected Fellows.

The Fellowship Coordinator may request a telephone interview with short-listed candidates. Candidates may submit separate applications for different themes (separate application forms must be used), but a maximum of 1 fellowship will be awarded to each successful candidate. Host Institutes may endorse applications from more than one candidate. However, a maximum of 3 awards will be made to any single Host Institute.

## **5. Financial support**

Maximum award amounts and duration for each fellowship type are provided below.

Postgraduate Research Fellowships: £9000 for a 12-month fellowship

Postdoctoral Fellowships: £13000 for a 12-month fellowship

Applications Project Fellowships: £6500 for a 6-month fellowship.

Fellowship awards must be used to cover the costs of implementing and carrying out the research/project activity including: travel to the Host Institute if required (round-trip, economy class airfare), accommodation and living expenses, the Host Institute's costs (e.g. registration fees). However awards may not be used to purchase equipment. Applicants are required to provide an itemised breakdown of all costs in the budget section of their Fellowship Proposal.

The CSRP will fund travel, accommodation and a living allowance for an induction visit (up to 4 weeks duration) to the MOHC for all successful applicants<sup>1</sup>. These costs should not be included in the applicant's budget.

Funding support will also be provided for fellows to attend and present results at a CSRP conference to be held late in 2012. These costs should not be included in the applicant's budget.

For successful candidates, the institute's costs will be paid directly to the Host Institute. Accommodation and living allowance will be paid directly to the successful applicant in instalments.

## **6. Requirements on successful candidates**

A brief 3-monthly progress report on research/project activities will be provided to the CSRP Fellowship Coordinator. A technical report summarising the research activities undertaken, methodology and conclusions of the study will be provided at the end of the study period. The technical report will be published on the CSRP website.

Fellows will be encouraged to develop their technical reports and submit them for publication in the peer reviewed literature and to present results at a CSRP conference.

## **7. Data and facilities available from MOHC**

The MOHC will provide, where appropriate, output from integrations of the HadGEM3 global climate model and HadGEM3-RA regional model. Retrospective forecasts from the MOHC dynamical seasonal forecasting system and decadal forecasting system will also be made available.

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<sup>1</sup> The induction visit is subject to the successful outcome of standard MOHC security procedures. It will be the responsibility of successful applicants to obtain the appropriate UK visa.

Examples of data that could be made available include the following<sup>1</sup>:

- Global monthly fields and some daily fields (e.g. rainfall) from continuous historical runs of the HadGEM3 climate model. Coupled ocean-atmosphere runs and atmosphere-only runs (forced by observed SSTs) are both available, at resolutions of either 120km or 60km, and typically 50-75 years in length;
- Monthly fields and some daily fields from retrospective ensemble forecasts (~15 years) from the GloSea4 ensemble seasonal forecast system;
- 6-hourly/daily/monthly fields, for the period 1989-2008 from the HadGEM3-RA Regional Model 50km/L63 runs over Africa, and similar data from other versions of PRECIS. In 2012, data from downscaled seasonal forecasts will also become available;
- Global monthly fields (and some daily fields) from decadal (10 year) retrospective ensemble forecasts with start dates covering the period 1960 to 2005. These will be of ~240km resolution;
- Access to a range of Hadley Centre global observational datasets and assistance with other freely available observational datasets (Note: in current global datasets coverage is often sparse over parts of the African continent and we encourage use of any datasets locally available within the fellow's home or host country).

Fellows will have access to CSRP web forums providing an opportunity to share and discuss results with other fellows as well as with other scientists working on African climate science at the MOHC and other institutes.

Each successful candidate will be assigned a MOHC mentor for the duration of the study period. The mentor will be an expert in the chosen theme and will provide advice on the direction and progress of research. The mentor will also review progress reports and the final technical report and provide advice on publication.

## **8. Contact information**

For more information on this Call for Applications please contact the CSRP Fellowship Coordinator ([csrcp-fellowship-coord@metoffice.gov.uk](mailto:csrcp-fellowship-coord@metoffice.gov.uk)).

For further information on the CSRP programme in general please visit the CSRP website <http://hadobs.metoffice.com/csrcp/index.html> or contact the CSRP Project Manager, Dr. Richard Graham ([richard.graham@metoffice.gov.uk](mailto:richard.graham@metoffice.gov.uk)).

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<sup>1</sup>Candidates are invited to contact the CSRP Fellowship Coordinator [csrcp-fellowship-coord@metoffice.gov.uk](mailto:csrcp-fellowship-coord@metoffice.gov.uk) for more information on available model and observational data.

## APPENDIX

### The CSRP priority themes

A strong preference will be given to candidates who propose a study or project that fits well with one or more of the 7 themes listed below, each with an exclusive focus on Africa or an African region. Candidates must nominate one theme which best describes the main focus of the proposed research or project. Candidates for Postgraduate or Postdoctoral Research Fellowships may select from any of the 7 themes. Candidates for Applications Project Fellowships should select from themes 4 to 7.

Postgraduate and Postdoctoral Research Fellowships only:

- 1) Evaluation of HadGEM3 representation and predictability of climate variability
- 2) Investigation of the mechanisms underlying climate variability
- 3) Attribution: the role of anthropogenic factors in observed climate extremes

All Fellowship types:

- 4) Seasonal forecast evaluation and use
- 5) Decadal forecast evaluation and demonstration of potential uses
- 6) Construction of regional historical observation datasets
- 7) Downscaling investigations and applications

More details on each of the 7 themes are provided below. The themes have been chosen to align with the top level science objectives of the CSRP. **Note that proposed research/project proposals may include work in several themes. Work under themes 1 and 2, for example, may also include downscaling investigations (theme 7). The theme selected for the proposal should be the theme within which most of the work will be conducted.**

Candidates are invited to contact the CSRP Fellowship Coordinator ([csrp-fellowship-coord@metoffice.gov.uk](mailto:csrp-fellowship-coord@metoffice.gov.uk)) for more information on the fellowship themes.

#### **Study theme 1: Evaluation of HadGEM3 representation and predictability of climate variability**

Studies in this theme will evaluate the performance of the HadGEM3 model for selected aspects of African rainfall variability and/or the circulation patterns underlying African rainfall variability. Studies may focus on the model's ability to represent the statistics of observed climate and/or on the predictability of inter-annual variations (using retrospective dynamical seasonal forecasts). Studies may include comparisons of HadGEM3 performance with that of other GCMs. The applicant should select the rainfall characteristics and climate modes to be studied. Examples of rainfall characteristics that could be studied may include patterns of the seasonal mean, onset date, season duration or extremes (drought or flood events). Example climate systems that could be studied include: the West African monsoon, tropical

temperate troughs, the Angola low, East African onshore moisture transport, tropical storm frequency in the western Indian Ocean.

**Study theme 2: Investigation of the mechanisms underlying climate variability**

Studies in this theme will investigate the mechanisms underlying African climate variability and teleconnection patterns, using analysis of historical observations and HadGEM3 model output. Example processes that could be studied include (but are not restricted to): transmission mechanisms underlying teleconnections (to e.g. ENSO, the Indian Ocean or tropical Atlantic), the role of convective processes, land surface influences.

**Study theme 3: Attribution: the role of anthropogenic factors in observed climate extremes**

Studies in this theme will address issues associated with evaluating the role played by anthropogenic factors in observed climate anomalies. Studies may focus on assessment of methods or systems for attribution and/or attribution case studies for observed events (e.g. droughts) in selected African regions. Studies may require preliminary work in collating suitable historical observation datasets required to robustly evaluate the extreme nature of the events studied.

**Study theme 4: Seasonal forecast evaluation and use**

Studies/projects in this theme will evaluate the skill of dynamical seasonal forecasts provided by the CSRP for a particular region or country and compare with the skill of current forecasts issued by relevant National Meteorological Services or regional centres. Potential focus areas for this theme may include working with regional centres to better integrate dynamical products into the Regional Climate Outlook Forum forecast consensus process; working with an identified user to develop and evaluate trial user products (e.g. in the agriculture, food security, water resource, or disaster risk management sector); investigation of the potential to provide products that go beyond the 'traditional' 3-month-mean seasonal forecast products, e.g. onset timing, season duration, frequency of heavy rain, frequency of daily temperature extremes, tropical storm frequency.

**Study theme 5: Decadal forecast evaluation and demonstration of potential uses**

Many sectors have planning timescales out to 20 years ahead and it is becoming increasingly important to develop prediction services on this 'decadal' timescale. Decadal prediction systems, which take account of evolving natural variability in addition to anthropogenic forcing, have been developed to address prediction needs for adaptation over the next few decades.

Studies/projects in this theme will evaluate the skill of decadal forecasts supplied by the CSRP. The applicant should select the variables/regions to be studied. Examples might include (but are not restricted to): predictability of seasonal rainfall anomalies 1, 2 or more years ahead, predictability of anomalies in multi-annual means (i.e. average of next 5 rainy seasons), predictability of trends in season onset and duration, predictability of the frequency of daily temperature extremes.

Fellows will form links with a potential user organisation concerned with adaptation on decadal timescales (e.g. in the government, agriculture, water resource or food security sector) and conduct a demonstration study assessing the potential contribution of decadal forecasts alongside other adaptation tools (such as risk assessments based on historical variability and predicted demographic changes).

**Study theme 6: Construction of regional historical observation datasets**

Studies/projects in this theme will compile historical regional observational datasets working first with national datasets and subsequently with datasets of other countries in the region who are willing to contribute data. Plans should include efforts to flag erroneous observations and ensure long-term stability of timeseries in order to transform the raw data into value-added products. Rainfall and temperature datasets on daily or 10-day timescales are of primary interest. Humidity and atmospheric pressure are also of high interest. Important themes include estimation of uncertainties in area-average rainfall in relation to gauge density, feeding into planning of observing networks and calibration of satellite-based estimates of rainfall. Data-rescue is an acceptable element of projects but is not expected to involve more than 20% of the study time.

**Study theme 7: Downscaling investigations and applications**

Studies/projects in this theme will be concerned with analysing regional climate model simulations/predictions from MOHC PRECIS system. Where appropriate, results should be compared against those obtained with statistical downscaling methods and other regional climate models. Potential focus areas for this theme include: evaluation of the benefits gained in the representation of the general climatology (e.g. geographical distributions, frequency of extremes); process studies (e.g. potentially as part of other work under theme 1); use of downscaled re-analyses to reconstruct observed climate in data-sparse regions. Studies/projects scheduled for 2012 could investigate the benefits gained from dynamical downscaling of GCM seasonal predictions. An Applications Project Fellowship might focus on developing or consolidating capacity to run the PRECIS system at a National Meteorological Service or regional centre (with preparation for downscaling of seasonal forecasts).