ESF EUROCORES on EuroCLIMATE

Call for Outline Proposals

What is a EUROCORES?

The EUROCORES (ESF Collaborative Research Programmes) is a new ESF activity designed to bring together national basic research funding bodies to collaborate on preferably multidisciplinary issues that have European-wide relevance. The aim of the programme is to maintain European science at an internationally competitive level. Participating ESF Member Organisations (national research councils and academies) jointly define a research programme, specify the type of proposals to be requested and agree on the peer review procedure to be followed. Final funding decisions stay with the national research funding agencies. In addition to the above, ESF offers its administrative support through networking scientists involved in the programme. Further background information on ESF EUROCORES may be found on the ESF web site (http://www.esf.org/eurocores).

Research funding opportunities in the field of EuroCLIMATE

Following agreement with ESF Member Organisations in Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, The Netherlands, Portugal, Spain, and Sweden, the European Science Foundation is launching a first Call for Proposals for research projects to be executed under the EUROCORES programme EuroCLIMATE. The programme will run for a minimum of five years and includes national research funding and a European networking component. Information on the programme is also available on the ESF website ***(http://www.esf.org/euroclimate)***.

The added value of EuroCLIMATE is that it calls for basic research addressing climate variability and the carbon cycle (past, present and future), and in particular their inter-relationship, in a European framework. Multi-proxy reconstructions from all available archives will bring the marine, the terrestrial and the ice-core communities together on cross-cutting issues, such as obtaining a common timeframe, and will allow coupled climate models used for global warming scenarios to be validated on European and regional scales. Only through such a collaborative effort is it possible to acquire sufficient critical mass to address these issues in a comprehensive and competitive way in Europe.

The background of EuroCLIMATE

Climate for the XXIst century (and thereafter) is expected to be largely different from the present and the recent past. CO_2 concentration in the atmosphere is presently already well above the values reconstructed over the last million years and is expected to reach levels unequalled over the past millions of years (if not tens to hundreds of millions). Temperature is also rising rapidly. 1998 has broken the record of the last millennium and 2002 arrived just behind. Temperature predicted for the XXIst century ranges well above what has occurred over the last hundreds of thousands of years.

In comparison, the last 150 years of meteorological observations and the reconstruction over the last millennium display a quite uniform climate. This time period does not therefore provide enough examples of what might happen over the next hundred(s) of years. Only the reconstruction of palaeoclimates extending much further back in time can help to build a data base offering a broader climatic diversity. Such a data base will, in addition, offer the possibility to test the reliability and robustness of the models used for future climate scenarios and thus to understand better how the climate system works.

Palaeoclimates offer an essential tool for analysing the response of the climate system to internal and external forcing, such as from greenhouse gases, volcanic activity and solar energy, and for understanding the physical, chemical and biological processes responsible for the changes. Reconstructions of past

climate must include not only longer time scales but also higher frequency variability. Such reconstructions not only involve time slices but must also include time series of climatic variables. Because of the complex non linear character of the climate system and the time lags of its response related to its long memory (ice sheets, deep ocean …), time series are invaluable to separate cause and effect.

To meet such goals, EuroCLIMATE must focus both on reconstructing past climates using different well-dated and calibrated proxy records and on modelling climate and climate variations for a better understanding of the underlying physical, chemical and biological processes involved.

Scientific rationale of EuroCLIMATE

1. Reconstructing past climates

1.1. Multi-proxy records from different archives

To understand the climate system response to a combination of natural and human-induced forcing factors, the interplay between forced and internally derived variability needs to be deconvolved. This requires long time series of key variables from historical documentary records and natural ice, marine and terrestrial archives. Whenever possible, proxies must be validated by comparison with high-quality instrumental series for the same period.

To significantly improve our ability to reconstruct climate variability beyond the instrumental period, which only covers the past two centuries, critical data need to be provided for testing/validating climate models over time scales decisive for climate projections. Hence, understanding the dynamics of climate variability on all relevant time scales and in adequate spatial resolution (to avoid generalisation of local information to large areas) requires careful application of palaeo-observation methods, particularly for the recent past where the signal-to-noise ratio is low, e.g. as compared with glacial climate variability. It also requires reconstructing different climate elements like precipitation, cloudiness, albedo, etc.

1.2. Development of a common chronology for palaeo-records of marine, terrestrial and atmospheric processes

In general the records of changing climate that are preserved in land, ice and marine archives provide the basic framework for describing the history of climate. In particular, the long and continuous ice cores that have been recovered from Greenland and from Antarctica contain a unique high resolution record of changes in the composition of the atmosphere (e.g. of greenhouse gases and dust) which have a direct influence on climate. The time series of all these proxy records need to be compared and therefore put into a common time frame. This must allow the analysis of leads and lags between the proxy records for a better understanding of the cause-to-effects relationships. This in turn will allow a correct use of the input and a better interpretation of the output in modelling experiments. Without this ability the response of climate models to any forcing will be very difficult to compare to proxy records and validation of models might be impossible.

Since the conventional dating techniques are not sufficiently accurate to allow a direct intercomparison of the proxy records, further studies are needed that must ultimately lead to an absolute time scale. EuroCLIMATE seeks to resolve these problems. Only with a fully consistent time frame will the massive investment in analysing continental records and in coring the ocean sediments and the polar ice sheets have big rewards in increasing our understanding of climatic processes.

1.3. Develop an understanding of existing proxies and develop new ones

In order to reconstruct the Earth climate system, palaeoclimatologists rely on empirical proxy relationships or historical

documents for widely different subsystems (oceanic, atmospheric, cryospheric or terrestrial). Empirical relationships may only be valid for the range of values of the parameters used in their calibration. Hence, interpretation of proxy relationships requires an understanding of the proxies themselves based on more physical, chemical and biological concepts.

To reach such a goal, it is important to determine and model thermodynamic, physiological and ecological controls on proxies, determine and model the effects of preservation of the proxies, and develop new proxies (e.g. salinity) and integrate these with established ones in order to arrive at the best estimate by using a multiproxy approach.

2. Modelling and understanding processes of past climates

2.1. The coupled climate system

Understanding the behaviour of the climate system requires understanding its individual components – atmosphere, hydrosphere, cryosphere, lithosphere, biosphere – and their interactions. This is a non linear system where the natural variability of the feedback processes as well as their response to external forcings render the system highly complex. Only numerical models allow the mechanisms which control climate and its variations to be investigated. They are validated using not only present-day climate, but also past climates which offer a large range of possible states. This is very important because they are the only tool for climate change scenarios of the XXIst century and because this is foreseen to be largely different from the climate of the last 100 years for which meteorological observations exist.

2.2. The carbon cycle

One of the urgent problems which need to be solved is the coupling between the biosphere (marine and terrestrial) and the climate system. This is crucial because CO_2 plays an important role in climate variations and cannot simply be used as an external forcing. Models where the carbon cycle is interactively coupled to the other components of the climate system seem indeed to enhance the sensitivity of the response to the anthropogenic forcing. More studies on the complexity of the carbon cycle and related nutrient cycles therefore need to be undertaken, covering time scales from glacial-interglacial cycles to the decadal variability.

Among the most important challenges remaining to be addressed by climatologists is the mechanism responsible for the observed coherence between climate change and a reorganisation of the carbon cycle. What are the positive and negative feedbacks responsible for this consistency?

On timescales longer than several overturnings of the ocean, the atmospheric pCO_2 is controlled by the oceanic carbonate chemistry. But what determines the lower and upper CO_2 concentrations during the last 400 ky, characterising glacial maxima (ca. 190 ppmv) and interglacials (ca. 280 ppmv)?

Carbon dioxide is not the only greenhouse gas playing a role in climate change. Methane is also very important and therefore it is worth understanding better the role of methane clathrates stored on the continental shelves and in the periglacial areas. If high polar latitudes are going to warm as much as estimated (over 4°C), how is the extent of permafrost regions going to change and affect climate?

2.3. The interactions between climate and vegetation

The distribution pattern of vegetation may be affected as a consequence of changing climatic conditions. In turn, changes in vegetation have a significant impact on climate by changing the albedo at the surface, the nature of the surface cover, the hydrological cycle (evapotranspiration) and CO_2 concentration in the air.

Not only must all the physical and biological processes involved be understood and quantified, but ongoing changes must also be carefully monitored, including in biotic diversity of key ecosystems.

This will also help to better understand how some proxy data are climatically and ecologically controlled (see 1.3) and make a link with programmes on biodiversity.

Programme structure and management

The programme will run for a minimum of five years with an expected start to research funding in 2005.

The programme will be overseen by a *Management Committee* formed from representatives of each national funding agency taking part.

The actual funding of the applications recommended by the international Review Panel will depend on the total amount of money made available in each country by the national funding agencies supporting the programme. The use of funds will be subject to the national laws of each country as well as to the internal rules of each national funding agency.

Once the Collaborative Research projects are launched, the ESF will support successful applicants involved in this EUROCORES Programme by networking them. This is expected to facilitate the exchange of information, communication and discussion of the results. Towards this aim, targeted workshops will be organised during the programme's lifetime. Web-based resources will also be developed to support the exchange of technical information, reagents and expertise and to promote collaborative interactions between European researchers working in this area.

Guidelines for proposals

Proposals from scientists from at least 2 countries participating in the programme will be eligible. A EuroCLIMATE proposal may involve cooperation with scientists from industry, non-ESF countries, or scientists from ESF countries not participating in EuroCLIMATE (Associated Projects funded from another source). Such scientists cannot however be proponents in the Collaborative Research proposal, the EUROCORES proposal must stand alone.

Besides relevance to the EuroCLIMATE programme and overall scientific quality/ excellence of the proposal, the following criteria will also be taken into consideration:

- Originality/Novelty
- Feasibility
- Level of transnational collaboration (including European added-value)
- Level of multi-disciplinarity
- Qualifications of the proponent(s)

Applications should usually cover three years although applications for shorter or longer time periods may be taken into consideration, depending on national regulations.

The application procedure will take place in two steps, the first for outline proposals, the second for full proposals.

Outline proposals

As a first step, *outline proposals* are invited by **31 October 2003**. These should include a scientific rationale of up to 1200 words (1-2 pages). Additionally, all intended partners (e.g. national, international, industry, university) and who is doing what within the collaboration should be clearly indicated. Outline proposals should include a one-page curriculum vitae of these partners, including a list of their five most important publications. Any equipment necessary should be specified and an estimate of the total project costs should be included.

An international Review Panel to EuroCLIMATE will pre-screen the outline proposals. The Panel may make recommendations concerning the further development of the proposal such as suggesting joining forces with teams in other countries. It may also reject proposals that are not considered to fit within the scope of the Programme. Successful applicants will be invited to submit full proposals.

Full proposals

As a second step, full proposals will be invited. The deadline for full proposals is expected to be around **1 March 2004**. Applications should contain a well-argued scientific case, work packages, a list of participants and a detailed budget. The budget requested from each national funding agency should be clearly specified.

Funds applied for within the EuroCLIMATE EUROCORES can include items such as salary for scientific and technical staff, equipment, travel costs, fellowships, etc according to the rules of the participating national funding agencies. These rules might also require the proposal to contain additional information.

Full instructions and application forms will be available on the web *(http://www.esf.org/euroclimate)* and will be available for downloading after the full proposal procedure has started.

A second Call for Proposals

It is anticipated that a second, more focused Call will be made in 2006/7 to cover the final years of the programme.

Outline proposals should be sent by email (in one attachment only) in pdf format by 31 October 2003 to:

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