

**English Version**

# **ÖAW Earth System Sciences (ESS)**

## **2013 Call**

**Call opens: September 1<sup>st</sup>, 2013**

**Call closes: October 15<sup>th</sup>, 2013**

*Everything that happens on our planet is part of a complex set of interactions between air, water, land, and life. Earth System Sciences encompasses all these interactions with a new focus on the connections among topics that were once studied separately. All Earth System Sciences is ultimately focussed on the question "How is the Earth changing and what are the consequences for life on Earth?"*

*From: Exploring Earth ([http://www.classzone.com/books/earth\\_science/terc/content/investigations/es0103/es0103page08.cfm](http://www.classzone.com/books/earth_science/terc/content/investigations/es0103/es0103page08.cfm))*

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## 1. Short description

The research programme Earth System Sciences (ESS), an initiative of the Austrian Academy of Sciences (ÖAW), financed by the Federal Ministry of Science and Research (BMWF), aims at researching the Earth System. To complement the existing grant portfolio, this programme supports interdisciplinary projects, long-term research projects and projects on currently little investigated themes with a scientific pioneering function. Within the overall theme of 'Change in the Earth System', the 2013 Call focuses on profile building and on combining resources on three (currently especially relevant) research topics: Extreme Events of the Earth System; Long-term Research on the Earth System; Predictability of Changes. Special attention is to be paid to ecosystem functions and ecosystem services as well as to developing adaption and mitigation measures. The research projects must be situated in the context of interdisciplinary mountain research (with a focus on the Alpine Space and comparable regions). The projects are expected to deal with the interactions between subsystems and – as much as possible – to provide contributions to **bilateral agreements**, to cooperate with current **international research programmes**, to help develop the Austrian **higher education and research sphere**, and, in cases of long-term research, to make use of existing long-term research sites and infrastructure.

The application process has two stages, an Expression of Interest and a Full Proposal. The deadline for expressing an interest is October 15<sup>th</sup>, 2013.

## 2. Starting point

### 2.1 Challenges to the Earth System – focus on interactions

Safeguarding natural resources is an important task for society. In view of current findings on changes in the Earth System, safeguarding natural resources is becoming quite urgent. Globalization, economic development, dramatically increased mobility, Global Change, demographic and economic changes all impact on the Earth System at every level, from a local to a global scale.

In order to take strategic decisions in these areas for the whole of society, it is vital to understand key processes of the Earth System and to be able to predict them as much as possible. This is quite difficult since essential developments cannot be taken as individual processes but must be understood as the result of an interaction of system components. From such interaction non-linear development paths evolve that are notoriously hard to predict. All the more important then for many societal decisions, e.g. in handling resources and extreme events, is gaining knowledge of the characteristics of interlinked system components and changes therein.

Earth System Sciences (ESS) are dedicated to understanding the complex Earth System, which is made up of physical, chemical, biological and social components, processes and interactions, all of which determine the state and dynamics of the planet Earth. In the Earth System Sciences the focus is on observation, understanding and prediction of global environmental changes, taking into account the interactions between land, atmosphere, water, ice, biosphere, societies, technologies and economic systems.

The planet on which we live has entered the age of the Anthropocene, an era in which humans drastically change their environment. Rising CO<sub>2</sub> levels in the atmosphere associated with the use of fossil fuels and the global warming linked to that are but the most prominent examples of Global Change caused by humans. If we want to be able to make predictions about the possible future state and development of our planet, especially about the changes caused by social impact on the environment, an integrated scientific approach is needed that involves natural, social, cultural sciences and humanities. The ESS use a systemic approach focusing on the interdependencies of the subsystems and/or their most serious

consequences. In short, the central aim is understanding the dynamics of the components of the Earth System and their development paths better.

## **2.2 The national and international research environment**

Various research programmes contribute to the ESS, including the UNESCO International Geoscience Programme (IGCP), UNESCO International Hydrological Programme (IHP), UNESCO Man and the Biosphere Programme (MAB), International Geosphere-Biosphere Programme (IGBP), International Human Dimension Programme (IHDP), World Climate Research Programme (WCRP), UN International Strategy for Disaster Reduction (ISDR) and Long-Term Socio-Ecological Research (LTSER). IGBP, IHDP and WCRP have joined forces with the international biodiversity network DIVERSITAS and formed the Earth System Science Partnership (ESSP). Shortly this partnership will be transformed into the research initiative Future Earth. Funding comes from national funding instruments and, at European level, via the 7<sup>th</sup> Framework Programme of the European Union, among others.

In Austria ESS research is carried out at universities and extra-mural research institutes. Essentially such research is found in bio- and earth science faculties, in engineering and environmental sciences and in social and economic science faculties, but also in interdisciplinary units that span the whole spectrum from natural sciences to humanities and social sciences.

## **3. Aims of the research initiative**

The Earth System Sciences (ESS) Research Initiative is dedicated to studying the physical, chemical, hydrological, biological, social, technological and economic processes of the Earth System and their interaction. As some of these processes and mechanisms are already being studied within specific disciplines in some existing programmes, the ESS Programme aims at complementing existing funding instruments by supporting projects with the following characteristics:

- Interdisciplinary projects to study the interdependencies between components of the Earth System, which integrate the portfolio of methods from different disciplines;
- Long-term research projects suitable to study the long-term dynamic behaviour of the components of the Earth System, which need long observation periods.
- High-risk/high-potential projects in scientifically pioneering areas in which hardly any research has been done to date.

The strategic aim of the Initiative is a strengthening of the Austrian research scene in its ongoing development and its international profile and to ensure top quality research. Such support comes through coordinated cooperation, profile building and pooling of resources in the guiding themes of the initiative. In this way the ESS Research Initiative enhances the networking and cooperation between individual disciplines and research groups. ESS is an interface between Austrian science and international research and is directly integrated in international research programmes and cooperation through its three national committees Geo/Hydro-Sciences, Global Change, and Man and the Biosphere.

In its main substance the research programme is part of the earth sciences, ranging from geology to hydrology and meteorology to biology and humanities, economic and social sciences, insofar as they relate to processes of Global Change and its challenges for society. The general theme is 'Change in the Earth System'. In an effort to strengthen the profile and to pool resources, the 2013 Call aims at three particularly topical research themes within the

general theme, i.e. Extreme Events, Long-term Research, and Predicting and Handling Change.

## 4. Research themes

### 4.1 Extreme Events in the Earth System

The research theme Extreme Events in the Earth System includes the climate, water cycle, biodiversity and geological-geophysical processes, from the surface to the earth's interior, as well as social, economic and technological processes for handling extreme events. Often these extreme events are largely driven by the dynamics of the system, which determine the different paths that developments may take. Climate and geological extreme events (e.g. floods, landslides, earthquakes, rise in temperature, drought) play a major role in the development of terrestrial and aquatic ecosystems as well as economic and social systems. They trigger changes in populations, biocoenoses and human settlement areas, which in turn may trigger further ecosystem changes. **Research is needed on the dynamics of extreme events in the Earth System, their preceding and/or trigger processes, as well as interdependencies with social and economic systems.**

Of special significance in connection with extreme events are the resilience of natural processes and the vulnerability of technical, social and economic system components vis-à-vis internal or external disturbances on different temporal and spatial scales. The theme includes the concept of ecosystem services, which is central to the assessment of the role of extreme events in the Earth System.

### 4.2 Long-term Research in the Earth System

Long-term research in the Earth System includes the climate, the hydrological cycle, biodiversity, geological and/or geophysical processes, both on the surface and in the earth's interior, as well as the economic and social systems. The phenomena that can be captured with methods from the natural sciences interact closely with the development of human societies, e.g. globalization or demographic change. On the level of the ecosystem and the landscape, for instance, ecophysiological and population-dynamical phenomena are closely linked with social, political and economic processes of spatial planning and land use. Long-term developments in terms of the LTER and LTSER concepts are historical and future changes on a timescale of decades or even centuries, but also include geological dimensions of time, e.g. the environmental dynamics of the Holocene. Short-term process dynamics may exert a strong influence on long-term developments through non-linear effects. In spatial terms the scale of these long-term processes in the Earth System can range from small 'open-air labs' to hydrological catchment areas, geoparks, biosphere reserves and socio-economic regions all the way to plate-tectonically relevant units.

One major component of this theme is the **study and monitoring of linked processes**, esp. between natural and social processes. High-quality research techniques designed for the longer term, plus methods of empirical social research are particularly relevant for this theme, if we want to gain new insights into long-term dynamics and their interdependencies. Key aspects here are the discovery and analysis of attitudes and action patterns vis-à-vis and/or within the system components. How regional actors act and the effect of these components on planning are central to long-term research of the Earth System. This is also relevant to issues of predictability of change.

### **4.3 Predictability and Handling of Change**

Predictability and handling of change includes not only the climate, the hydrological cycle, biodiversity, geological and/or geophysical processes but also the related social and economic processes. In contrast to the other two themes of this call, Extreme Events and Long-term Research, the focus here is on predictability, i.e. quantification or at least the ability to estimate future process dynamics, as well as and closely connected with it, how to handle such developments. Which social, political and socio-economic processes are crucial for a development and to what extent? How can they be applied in a targeted and efficient manner to achieve aims set by society? In dynamic non-linear systems identical starting points may lead to quite different developments; non-linearities occur in many subsystems, for instance, in aquatic ecosystems but also in societal governance structures.

**Handling incomplete, uncertain and contradictory knowledge** plays a key role in this context. The uncertainties inherent in the prediction of certain processes can be assessed through joint approaches or through comparison with observation data of similar current system states, by comparing different hydrological regions or different economic and social conditions. In connection with uncertain social developments, transdisciplinary approaches like, for instance, participatory scenario processes are feasible. As with the other themes of the call, the idea is to combine approaches from different disciplines in order to understand interdependencies between the subsystems of the Earth System better. This theme is related to the other two themes in terms of research on extreme events or long-term developments impacting on the predictability of trends and processes.

### **4.4 Principles**

The research projects should be placed within the context of interdisciplinary mountain research (with a focus on the Alpine Space and comparable regions).

The submitted research proposals should

- deal with interdependencies of subsystems and, in particular,
  - contribute to an interdisciplinary understanding of the interdependencies of processes and the effect of these processes on ecosystem services;
  - study the effect of process interactions on social and economic activities and vice versa;
  - test the resilience of the systems to process interactions;
  - achieve a better spatio-temporal resolution of data;
- contribute to bilateral agreements such as the Memorandum of Understanding on the creation of a Swiss-Austrian Alliance to support research into sustainable development in European mountain regions (<http://www.chat-mountainalliance.eu/en/>) or the Operational Programme Slovenia-Austria;
- contribute to international research programmes and/or strategies;
- enhance the development of the Austrian higher education and research sphere (interinstitutional cooperation);
- in the case of long-term research projects, use existing sites and infrastructure of long-term research (e.g. LTER sites, biosphere reserves).

## **5. Implementation of the Research Initiative**

### **5.1 Basics**

The Earth System Sciences (ESS) Research Initiative is coordinated by the Austrian Academy of Sciences (ÖAW). To this end National Committees have been established for three research areas: Geo/Hydro-Sciences, Global Change, and Man and the Biosphere (MAB). These National Committees (NCs) monitor the Austrian research scene, analyse its strengths and knowledge deficits and, together with the ESS Advisory Board, the ESS Board of Trustees and the Processing Agency, they work out targeted new research foci. The tasks of these National Committees include producing a draft call text, selecting the reviewers and obtaining reviews of the project proposals in their respective research area. The Chairpersons and Deputy chairs of the three NCs jointly produce a ranked list of the full project proposals and pass it on to the ESS Advisory Board.

The international ESS Advisory Board advises the ESS Board of Trustees on setting up the framework conditions for the calls and the project implementation. The Processing Agency supports the NCs in the administrative handling of the relevant functions.

The 2013 Call aims to support interdisciplinary projects, long-term research projects and high-risk/high-potential projects related to the themes Extreme Events in the Earth System, Long-term Research on the Earth System and Predictability of Change. The projects must take into account the state of the art in the respective research areas, produce innovative insights, apply methods that meet current scientific standards and aim at problem solving. A connection of the project with one or more international programmes is desirable to strengthen integration into international research. Reviewing will be done by independent experts on the basis of scientific quality criteria within the objectives of the call.

### **5.2 Application process**

The project proposals must meet the standards of international research. Any proposal must indicate which of the three NCs (Geo/Hydro Sciences, Global Change or Man and the Biosphere) it primarily (and, if applicable, in a second instance) relates to. The application process will be handled by the primarily related NC.

The call is open to any researcher active at an Austrian research institution. Young scientists (up to 10 years post-doc) are especially encouraged to submit project proposals. Cooperation with international partners is welcome, but the project must be coordinated from Austria. A total of no more than 20% of the granted funds may be passed on to foreign partners; any transfer of grant money to foreign project partners must be well-founded.

The maximum total volume of the project must not exceed EUR 350,000. The maximum duration is three years. If a project is designed as a long-term study exceeding three years, this must be declared in the proposal, stating the intended duration. For budgetary reasons, projects can only be granted for a maximum of three years' duration, therefore potential long-term studies should be designed in such a way that they can be wound up after three years with usable results. The maximum proposed sum for one-year projects is EUR 50,000. To facilitate international reviewing the proposal must be submitted in English. The application process has two stages:

First Stage – Submission of an *Expression of Interest (EOI)*. The EOI should outline concisely the project concept, the individuals and/or institutions involved and the necessary funding. Submission of the EOI must be in digital form (as pdf or MS-Word file) and signed, using the EOI form available from the ÖAW website, and sent to the Processing Agency of the Research Initiative (see contact in Table 1). EOIs that meet the call foci and are considered

particularly innovative will be invited to produce a Full Proposal. Around six weeks after the call closes the applicants will be informed about the decision by email.

Second Stage – Submission of a Full Proposal. The form available from the ÖAW website must be used to submit the Full Proposal. It must include a detailed description of the research question, the innovation potential, the methodology and a proposed budget. Documentation of the expert knowledge of the submitting project team must be included.

Table 1: Details for the submission of the Expression of Interest and the Full Proposal

Contact and Submission address:	Dr. Günter Köck National and International Research Programmes Österreichische Akademie der Wissenschaften Dr. Ignaz Seipel Platz 2, 1010 Wien Tel. +43 1 51581 1271, Fax +43 1 51581 1275 Email: guenter.koeck@oeaw.ac.at WWW: <a href="http://www.oeaw.ac.at/deutsch/forschung/programme.html">http://www.oeaw.ac.at/deutsch/forschung/programme.html</a>
Expression of Interest form:	<a href="http://www.oeaw.ac.at/fileadmin/forschung/EOIForm_ESS.doc">www.oeaw.ac.at/fileadmin/forschung/EOIForm_ESS.doc</a>
Full Proposal form:	<a href="http://www.oeaw.ac.at/fileadmin/forschung/ESSProjectApplicationFormular.doc">www.oeaw.ac.at/fileadmin/forschung/ESSProjectApplicationFormular.doc</a>

### 5.3 Selection process

The submitted **Expressions of Interest (EOIs)** are checked by the Processing Agency for formal compliance (e.g. completeness). EOIs that do not meet the call requirements are discarded. The remaining EOIs are presented to the NCs for consideration. The NCs produce a list of EOIs that they consider acceptable. The Chairpersons and Deputy Chairs of the three NCs then select the EOIs to be invited to submit a Full Proposal. The NCs reserve the right to contact the applicants in well-founded cases (for instance with overlapping or complementing EOIs) and to make recommendations aimed at raising the quality of the proposal (e.g. cuts, joint proposals).

All submitted **Full Proposals** undergo a formal check by the Processing Agency. Proposals that meet the formal criteria are put under review. Each Full Proposal is seen by at least two reviewers. These are independent experts from various disciplines who work abroad. The reviewers are taken from a pool of names suggested by the NC and the project applicants. All proposals and reviews are treated in confidence. The reviewers must declare any bias; biased individuals are excluded from the process. The project applicants may name up to three individuals to be excluded as reviewers.

The reviewers receive the proposal plus the call text and the reviewing criteria, which are:

- Compliance with the specific research questions of the programme.
- Originality of the proposal: this criterion assesses the innovative scope of the proposal, for instance, if it applies a new research approach.
- Suitability of the method: this criterion assesses whether the proposed methods are suited to answer the scientific questions of the project as measured against international standards.

- Added scientific knowledge: this criterion assesses if the project can be expected to deliver important new results as measured against international standards.
- Inter- and transdisciplinary approach.
- Reasonable costs, appropriately qualified personnel and adequate infrastructure.

The reviewer awards a score for each criterion, from 0% (inadequate) to 100% (exceptional). The total score of the proposal is calculated as the mean of the individual scores. The reviewer adds a statement or rationale of the score for each criterion and suggests accepting (possibly with additional requirements) or rejecting the project.

The assessment of the projects by the reviewers is either carried out via individual reviews (at least two reviewers per project) or in a two-day meeting of reviewers at the ÖAW. On the basis of the reviewers' assessments the NCs draw up a qualitative ranking of the proposals in their specific research area. The final ranking is carried out by the Chairpersons and the Deputy Chairs of the three NCs. They pass on their recommendations to the ÖAW and the BMWF. The final decision on the proposals is made jointly by the BMWF and the steering committee of the ÖAW. The project applicants are then informed of the decision. In accordance with international standards the decision is argued closely. Anonymized excerpts from the reviews will be made available.

#### **5.4 Project support and evaluation**

The project organizers must report to the respective NC every 12 months by submitting an interim report and a final report at the end of the project. This can be done by referring to the highlights if the content has been sufficiently covered by publications. At an annually held workshop at the ÖAW the project teams present their ongoing projects to the ESS Advisory Board, the Chairpersons and the Deputy Chairs of the three NCs and representatives from BMWF and ÖAW.

In line with international standards the project organizers are expected to publish the research results in internationally recognized journals with a peer-review system to ensure adequate quality.

Each NC monitors its research projects by reviewing the reports and participating in the workshops. At the end of the project the NC may send the final report and the publications created within the project to external reviewers for an assessment. In the case of inadequate project reports, the processing agency may halt payment of the next instalment until any shortcomings are remedied.

#### **6. Schedule**

The schedule below is valid for the 2013 Call of the Earth System Sciences (ESS) Research Initiative of the Austrian Academy of Sciences (ÖAW). The date of the relevant email transmission counts for each deadline.

**Table 2:** Schedule for the Earth System Sciences (ESS) Research Initiative of the Austrian Academy of Sciences (ÖAW), 2013 Call.

October 15 <sup>th</sup> , 2013	Deadline for EOIs
End of November 2013	Invitation to submit Full Proposal
January 31 <sup>st</sup> , 2014	Deadline for submission of Full Proposal
Middle of April 2014	Decision on granted projects