



Thematic Actions

Coordinating Universities for the Proposal: UCM and UPM

Title of Action	Laboratory for Climate Change and Impacts		
Participating partners	UCM, UPM, CIEMAT, CISC, AEMET	Other participants	
Personnel involved (indicate institution)	UCM (Physics, Geology, Mathematics, Geography and History), UPM (Schools of Forestry, Agriculture, Civil Engineering), AEMET, IGEO UCM-CSIC Institute of Geosciences, CIEMAT (Renewable Energies, Environment).		
Start date	2010	End date	
Cluster	Global Change and New Energies	Other clusters	
Areas of action	Teaching Improvement and EHEA Deployment / Research / Knowledge Transfer		
Location	Faculty of Physics, Faculty of Geology, Faculty of Mathematics, Faculty of Geography and History, ETSIA, ETSICCP, CIEMAT, AEMET.		
Infrastructures involved	EOLO: Climate Change Supercomputing Cluster (to be acquired) SILAB: Climate Proxy Laboratory (to be completed)		
Keywords	Climate change; Climate modelling; Climate impacts; Climate variability; Palaeoclimate; Uncertainty; Adaptation; Mitigation.		
<p>Objectives:</p> <p>The main aim of the Laboratory is the analysis and modelling of the climatic system (atmosphere, oceans, cryosphere, biosphere and their interactions) and the impacts of climate change. This topic will be studied on different scales of time and space, spanning the time period ranging from geological periods to the end of the 21st century.</p>			
<p>Description of the action:</p> <ol style="list-style-type: none"> 1. Generation of natural and documentary climate proxies modelling former climates, with emphasis on the last millennium. 2. Modelling and analysis of the mechanisms responsible for climate variability during the 20th century, with special attention to the decadal variability of temperature, precipitation and circulation patterns. 3. Generation and analysis of climate scenarios for the 21st century. 4. Evaluation of climate change impacts, including adaptation and mitigation strategies on sectors such as energy, agriculture and health and the uncertainty associated with forecasts. 5. Improvement of the computational efficiency of meteorological and climate models and of impact simulation systems. <p>Action 1 will be developed by the UCM, IGEO and CSIC, 2 & 3 by the UCM, AEMET and CIEMAT, 4 will rely mostly on UPM with some participation from UCM and CIEMAT, and 5 will be headed up the UCM with participation from UPM. There is a clear link among the five actions. Thus, a better knowledge of the past variability (1) and the mechanisms involved in 20th century processes (2) will result in an improved capability to model the 21st century climate (3). The availability of better models will result in a better estimation of impacts and adaptation strategies (4). The improvement in the computational efficiency of models (5) will be of application to the rest of the actions.</p> <p>Because of low levels of interaction between the groups to date, there is a need to define a strategic plan for effective integration. This will allow the identification of the main topics of cooperation and the definition of criteria for use for the EOLO and SILAB laboratories. Thus the first year will be devoted to the discussion and approval of the strategy plan, which will become effective during the second year. Simultaneously, EOLO and SILAB will be defined and acquired.</p>			
<p>Planned key results:</p> <p>The main result will be an improved understanding of the climate system and climate change impacts. The added value of the Laboratory will result in an increase in the number of graduate students and in the quality of published papers. In the area of knowledge transfer, the laboratory will allow the fostering of closer relationships with the private sector, which should result in an increase in the number of contracts with private companies. The multidisciplinary approach will allow comprehensive research on climate change, of use for regional and national governments. The participation of AEMET will allow easier knowledge transfer towards public institutions. The Laboratory will participate in the I2C2 activities established by the Ministries of Environment and Innovation.</p>			



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<p>Rationale for the action:</p> <p>The participants have submitted a high number of quality papers. However, the computational and analytical resources are currently insufficient. In fact, most of the models used so far are run in computation facilities located in other institutions in Spain and abroad. This is a severe limitation for the development of the applicant groups. The creation of the Laboratory and the use of its facilities for computation and data gathering and storage will increase the efficiency and quality of the work.</p> <p>Previous interaction among the groups has been low, except in palaeoclimatology, where UCM and CSIC cooperate within the IGEO (Geosciences Institute). The Laboratory will be an opportunity to create a multidisciplinary group of physicists, geologists, mathematicians, geographers and engineers. The members will be able to combine their expertise on climate sciences, palaeoclimatology, computing sciences, modelling, geology, hydrology, signal analysis, agricultural and forest engineering, and other related fields. The effective integration of these groups will be a main challenge for the Laboratory, which will become a multidisciplinary laboratory with expertise that is unique in Spain.</p>	
<p>International aspects:</p> <p>The applicants have a high level of international cooperation, with 50% of papers including international partners. However, the number of international students and visitors is not significant. The existence of the Laboratory will mean higher visibility, more computational power and unique analytical facilities, which will result in a more attractive environment for international students. This will also allow the strengthening of links with research teams abroad, since the use of the computing and analytical facilities will be open to other groups.</p>	
<p>Planned impact:</p> <p>The integration of computational and analytical facilities will convert the centre into an interdisciplinary laboratory unique in the international panorama. It will allow closer cooperation among the applicants and better access to computing and analytical facilities. This will have an impact on education, research and transfer. In education, the participation of AEMET will mean greater emphasis on practical and operational meteorological topics. The clustering of the groups will also create a more attractive offering for international graduate and undergraduate students.</p> <p>The facility will allow the use of more and better climate and impact models, with higher resolution in time and space, leading to an increase in the quality and visibility of the publications. No other centre in Spain would gather such a high number of researchers with such a broad scope. Thus, the Laboratory will act as a focal point for climate change research and education in Spain. The use of its facilities by other groups at the national and international level will increase the collaboration of the applicants.</p> <p>The SILAB (Climate Proxy Laboratory) is a state-of-the-art analytical reference facility that will conduct basic and applied geochemical research focused on the acquisition of high resolution climate proxy data from natural materials like sediments, speleothems, other sedimentary rocks, fossils, tree rings, etc. Because of its dedication and specialisation, the Laboratory will be unique in Spain. It will implement different techniques already available and running in the UCM and CSIC, and will incorporate a new system for the measurement of light stable isotope ratios. Research projects will include studies within the areas of climatology, paleoclimatology, environmental geology, ground water and vadose zone hydrology, and biogeochemical processes. The integration of climate and impact modellers in the Laboratory will enhance interaction between them and facilitate collaboration with potential new users of climate and impact data.</p>	