



CORDEX Flagship Pilot Study "LUCAS - Land Use & Climate Across Scales" - a new initiative on coordinated regional land use change and climate experiments for Europe

Diana Rechid (1), Edouard Davin (2), Nathalie de Noblet-Ducoudré (3), Eleni Katragkou (4), and the LUCAS Team

(1) Climate Service Center Germany at Helmholtz Zentrum Geesthacht, Hamburg, Germany (diana.rechid@hzg.de), (2) Eidgenössische Technische Hochschule Zurich, Switzerland (edouard.davin@env.ethz.ch), (3) Laboratoire des Sciences du Climat et de l'Environnement, Institut Pierre Simon Laplace, Paris, France (nathalie.de-noblet@lscce.ipsl.fr), (4) Department of Meteorology and Climatology, School of Geology, Aristotle University of Thessaloniki, Greece (katragou@auth.gr)

The new project LUCAS (Land Use & Climate Across Scales) was initiated jointly by EURO-CORDEX and LUCID (Land-Use and Climate, IDentification of robust impacts) and has been endorsed by WCRP CORDEX as a flagship pilot study. The overall objective of LUCAS is to identify robust biophysical impacts of land use changes on climate across regional to local spatial scales and at various time scales from extreme events to multiple decades. In this context, land use changes (LUC) refer to anthropogenic land cover conversions as well as land management practises. We identified major science questions to be addressed:

- How large is the relative contribution of LUC to detected past and potential future climate trends?
- How do land use practices modulate climate variability? Can local LUC reduce or amplify extreme climate conditions?
- What is the effect of spatial resolution on the magnitude and robustness of LUC-induced climate changes?
- How sensitive are the regional climate models to LUC and how is this interrelated to land-atmosphere coupling in different regions among the suite of models?

In order to derive robust answers, we initiate a new era of coordinated regional climate model (RCM) ensemble LUC experiments on high spatial resolutions based on consistent land use dynamics for the past and the future. We include a new generation of RCMs which couple regional atmosphere interactively with further components of the regional earth system, e.g. terrestrial biosphere and hydrosphere. Land use pathways will be chosen in cooperation with land use modelling experts. The multi-model experiments will be conducted over multiple gridded nests to refine the continental simulations down to resolutions below 5 km. Simulated variables and fine-scale processes will be evaluated against multi-variable observations from flux towers, satellite sensors and new airborne and spaceborn radar techniques.

In this conference contribution, we will present the overall framework of the LUCAS flagship pilot study and give an overview of the planned simulations over Europe. We will point to some major challenges for coordinated LUC experiments with regional climate models on high spatial resolution and discuss some first approaches how to address those challenges. We would like to invite the research community, also beyond EURO-CORDEX, to engage in this new initiative. We want to connect expertise of global and regional modelling activities related to land use and climate dynamics and develop a better link to land use policies and socio-economic land use modelling with local perspectives.