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Combining the regional downscaling expertise in Belgium: CORDEX and beyond

DURATION
15/12/2014 – 15/03/2017

BUDGET
1.022.525 €

PROJECT DESCRIPTION

Much expertise is present in Belgium concerning climate-change research. The aim of the CORDEX.be project is to combine *existing and new* research activities of nine Belgian partners in the domain of climate modelling to create a *coherent* scientific basis for climate services in Belgium. The institutes involved are the Royal Meteorological Institute Belgium (RMI), the University of Leuven (KU Leuven), the Université Catholique de Louvain (UCL), the University of Liège (ULg), the Flemish Institute for Technological Research (VITO), the Belgian Institute for Space Aeronomy (BISA), the Royal Belgian Institute of Natural Sciences (RBINS) and the Royal Observatory of Belgium (ROB).

Since climate change is a topic of strong and international interest, overarching frameworks exist in the context of which this project will be placed. For instance, instructions for climate services are outlined by the Intergovernmental Panel on Climate Change (IPCC) in their recent Fifth Assessment Report (AR5). In the context of *regional* climate modelling, the most important project worldwide is CORDEX ("Coordinated Regional Climate Downscaling Experiment"). Based on new and existing scientific results, these efforts will be translated to the Belgian level in a form that is useful and understandable for users.

The main project objectives are:
Objective 1: Contribute to the CORDEX project on the European domain.
Objective 2: Produce high-resolution "CORDEX.be" climate runs over Belgium.
Objective 3: Address specific climate-related issues using local climate-impact models.
Objective 4: Climate projections will be combined in a coherent framework including statistical downscaling and uncertainty estimates for the Belgian level.

The outcome of the project will constitute a basis for developing climate services.

Objective 1: Contribution to the international CORDEX project:

The purpose of CORDEX is to coordinate an international regional-climate project using the technique of downscaling to provide an "ensemble" of regional-climate simulations including varying Global Climate Model (GCM) simulations, varying greenhouse gas concentration scenarios, natural climate variability and different downscaling methods. Such ensemble is required to improve predictions but also to estimate their uncertainties. The CORDEX downscaling activities are based on the latest set of GCM climate scenarios and predictions produced within the 5th Coupled Model Intercomparison Project (CMIP5) reported in the AR5 and follow the so-called Representative Concentration Pathways (RCPs). The highest prescribed resolution of CORDEX is 12 km. The collected climate data is centrally archived and readily available and therefore used worldwide by the research community. Four upper-air modelling partners participating in this project will enter the CORDEX project.

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Objective 2: Beyond CORDEX: high-resolution runs

The four partners contributing to Objective 1 will contribute to Objective 2 by running models at higher resolution on a small domain over Belgium. Together these model configurations create a *Belgian ensemble called the CORDEX.be ensemble* at spatial resolution of 3 to 5 km, higher than the highest CORDEX resolution of 12 km. The CORDEX.be model runs therefore include more detailed descriptions of the model physics than the CORDEX runs. These simulations will be validated with respect to conventional observations and more sophisticated data such as GPS data products.

Objective 3: Beyond CORDEX: local-impact models

The model outputs of the CORDEX.be ensemble will then be used to drive the local-climate-impact models for studying urban effects, storm surges, ocean waves, vegetation emission and crop production. The deliverables will be past and future time series of severity indices.

Objective 4: Inferring the climate uncertainties to the Belgian level

Following the data-production Objectives 1, 2 and 3 the aim of Objective 4 is to process the data into coherent climate information with a best estimate of their uncertainties using the CORDEX.be ensemble. A key scientific innovation of this project resides in the methodology for the data processing, both by applying innovative techniques of statistical downscaling, bias correction and impact-centric climate scenario development for new specific applications and by validating the methods.

Expected Research Results

Apart from the impact-severity indices the following research results are expected:

1. Belgian contributions to the CORDEX archive including new projections.
2. The definition of the CORDEX.be ensemble of the high-resolution Belgian climate runs including uncertainties. Future end users will be able to use these data and they will not have to question themselves whether the information is *coherent* with other Belgian climate information.
3. A report will be made with an overview of the climate modelling in Belgium with its potential to address the needs of the stakeholders.
4. There will be novel scientific outcomes published in international journals.
5. Based on the case studies that will be designed during the course of the project, the first steps towards the creation of a Belgian database containing high-resolution RCP output and impact data will be initiated. These data can serve as an example for providing climate services.

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LINK(S)

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