

## The North American CORDEX Program – Briefing Document

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### I. Description

The North American CORDEX program will produce multi-decadal downscaled simulations and data sets for North America using multiple statistical and dynamical downscaling models driven by an ensemble of global climate models (from the CMIP5 data set), according to the specifications of the International CORDEX Program ([url: http://wcrp-cordex.ipsl.jussieu.fr/](http://wcrp-cordex.ipsl.jussieu.fr/)). The various downscalings will use ERA-Interim (reanalysis) boundary conditions for the period 1989-2008, historical simulations driven by CMIP5 GCMs for 1950- 2006, and scenario runs for 2006 – 2100, for the RCP 8.5 and 4.5 scenarios. Dynamical downscaling will use a balanced matrix of GCM-RCM combinations focused on 25 km and 12 km resolutions. Statistical downscaling will use the same set of GCMs.

The simulations driven by the ERA-Interim reanalyses for 5 RCMs will be performed at three resolutions: 50, 25, and 12 km to explore added value of the downscaling and provide an initial assessment of uncertainty. For GCM-driven downscaling, we currently envision a matrix of 6 GCMs driving 5 different RCMs (a total of 30 runs, 150 years each). Selection of which GCMs to use will be made based on model climate sensitivity and quality of boundary conditions. In addition, some downscaling will be performed using multiple realizations of a particular GCM as drivers, to determine the effect of the internal variability of the GCM on the downscaled output.

The purpose of the simulations and analyses is to provide climate scenarios for use by impacts and adaptation researchers and decision-makers (e.g., water resource managers, agricultural managers, and ecosystem managers) to explore the potential effects of climate change on various human and natural systems. It will also allow exploration of the uncertainties regarding future regional climate change at resolutions relevant for impacts and adaptation planning. Furthermore, it will provide the opportunity to determine the added value of high-resolution regional model simulations that arises in part by including processes missing in coarser resolution global climate models.

It will build on the experience and knowledge gained from the North American Regional Climate Change Assessment Program (NARCCAP), which used four CMIP3 GCMs to drive multiple RCMs at 50 km resolution for two time periods (current and mid-21<sup>st</sup> century) for the A2 emissions scenario. The knowledge base of NARCCAP includes over 100 peer-reviewed publications. The program will also learn from CORDEX experiments completed or underway in Europe and elsewhere, as well as other regional climate modeling efforts underway in the US and Canada.

### II. Stage of Research

While some NA-CORDEX simulations have been performed by several research groups (Canadian, French, British, Swedish) not many have been produced by US researchers (except by Iowa State and the University of Arizona). The stage of the formal program in the US is the production of a research plan for the Program. NA-CORDEX planning meetings have occurred in conjunction with the AGU Annual Meeting (December 2012), at the SF Public Utilities Commission Office, the NCAR Societal Dimensions Working Group (SDWG) of the CESM Meeting (February 2013) at NCAR, and an additional meeting June, 2013 at NCAR. These meetings gathered a number of researchers, including climate modelers, statistical downscalers, impacts researchers, and decision makers. We have also discussed the possibility for funding with several program managers (i.e., DOE, NOAA, and NSF).

### **III. Applications**

1. Scenarios for use in various resource contexts (e.g., water resources, agriculture, human health, energy) to determine the effects of climate change.
2. Further exploration of uncertainties and added value through detailed process-level analysis regarding future climate change

### **IV. Advantages**

Provides high-resolution (25 and 12 km) climate scenarios for use in addressing the climate change problem over North America, motivated in part by expressed needs of the user community. Also, particular attention will be paid to preparing output datasets for ease of use by users (researchers and decision-makers), and providing guidance material for appropriate use, i.e. we intend to develop a robust service component to guide and assist with the use of NA-CORDEX output. CORDEX is a high-profile international program in which the US should participate.

### **V. Research Partners and Key Collaborators**

Currently the program is co-Chaired by William J. Gutowski, Iowa State and Linda O. Mearns, NCAR. An executive committee has been established which includes, the co-Chairs, J. Barsugli, U. Colorado and NOAA; L. Buja, NCAR; G. Garfin, U. Arizona; R. Leung, PNNL; and D. Lettenmeier, U. Washington. Science, Services, and Applications committees have also been established. Additional key collaborators include: S. Pryor, Cornell U.; K. Hayhoe, Texas Tech; C. Bruyere, G. Holland, NCAR; M. Bukovsky, S. McGinnis, S. Sain, and D. Nychka, NCAR; Chris Anderson, Iowa State; René Laprise, U. Quebec at Montreal; Xin-Zhong Liang, U. Maryland; and AgMIP leaders. Also, coordination will be made with groups planning 'CORDEX' relevant runs (e.g., R. Kotamarthi, Argonne National Lab, Chris Castro, University of Arizona, and Ray Arritt, Iowa State). Additional collaborators will be sought regarding expertise for specific RCMs and for additional applications sectors.