Brief summary of the "ICRC-CORDEX 2019 International Conference On Regional Climate"

Session: D6
Theme: Hybrid downscaling methods
Day and time: October 17, 14:00-16:00
Chair(s): Abdelkader Mezghani and Stefan Sobolowski
Rapporteur: Bo Huang

Downscaling is a key aspect in most studies of climate change and its consequences, as it reduces the gap between climate model output and observations. Two widely used methods have been developed by two separate scientific communities such as dynamical (DD) and empirical-statistical downscaling (ESD). While DD is primarily based on the physical understanding of processes and phenomena, ESD tries to reproduce the statistical properties (e.g. variability, extremes, …) of particular climate variables or phenomena.

There were two oral talks followed by a round table open discussion. One talk is made by Dr. Mezghani, from MET Norway, who introduced the two worlds of downscaling. His presentation entitled "climate simulations based on dynamical and statistical downscaling" discussed challenges related to "local climate simulations". He mentioned the strengths and weaknesses of DD and ESD. He also introduced a technique on how to combine DD and ESD including training and simulation framework, ensemble of opportunities, etc. The other talk was given by Lulin Xue from NCAR. His talk presented the best of both worlds, processed-based and data-driven regional climate simulations. He showed a hybrid downscaling model simulation called ICAR with significantly reduced computational time consumption including a convection permitting simulation.

In the open discussion, we tried to answer three main questions that are:

1. Can we validate and expand RCM results to cover the full multi-model ensemble of GCMs using ESD and hybrid methods?
2. Can we use ESD to study how the physical connections are captured? E.g. Non-convective vs. Convective RCMs?
3. Can we build a consistent framework to be used in the CORDEX FPS protocol?

The main conclusion of the session was that there is a need to support hybrid models as well as ESD techniques that can be used to reduce computational costs, validate RCM results, as well as, allow considering a wider range of multi-model ensemble of GCMs in the evaluation. For instance, ESD can be used to study how the physical connections are captured which can help building process-based emulators and opens new avenue for including Machine Learning applications. Another example is ICAR, which is a quasi-dynamical downscaling approach, based on simplified wind dynamics that can perform high-resolution meteorological simulations 100 to 1000 times faster than a traditional atmospheric model, hence, it can be used to better characterize uncertainty across numerical weather prediction models and climate models, and cover a larger ensemble of dynamical downscaling. We also agreed that submitting a common FPS based on hybrid approaches could help strengthen collaboration between institutions would be useful.

The group discussion also highlighted the need of evaluating additional climate variables rather than focusing on precipitation and temperature, including extremes, as well as, making ESD data open and visible to the larger audience, similar to what has been done in COST-VALUE action.