WCRP CORDEX 17TH-20TH MAY 2016 STOCKHOLM, SWEDEN ICRC-CORDEX 2016

PARALLEL SESSION B : FRONTIER DOWNSCALING TOOL
B1: VERY HIGH RESOLUTION MODELLING

Regional Convection-Permitting Climate Modeling: Demonstrations, Prospects, and Challenges

Andreas PREIN

National Center for Atmospheric Research - USA

Very high-resolution atmospheric models, that enable the explicit simulation of deep convection, revolutionized severe convective weather forecasting. These convection-permitting models (CPMs; horizontal grid spacing ≤4 km) viable for climate simulation because of advances in computational resources. CPM climate simulations have the potential to provide climate information on regional- to local scales compared to the more traditional large-scale models (LSM; horizontal grid spacing >10 km). CPMs also allow a more accurate representation of surface and orography fields. We aim to provide a common basis for CPM climate simulations by giving a holistic review of the topic. The most important components in CPMs such as physical parameterizations and dynamical formulations are discussed critically. An overview of weaknesses and an outlook on required future developments is provided. Most importantly, this review presents the consolidated outcome of studies that addressed the added value of CPM climate simulations compared to LSMs. Improvements are evident mostly for climate statistics related to deep convection, mountainous regions, or extreme events. In conclusion, CPMs are a very promising tool for future climate research. However, coordinated modeling programs are crucially needed to advance parameterizations of unresolved physics and to assess the full potential of CPMs.