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# Understanding global warming impact on climate extremes by mean of Coordinated Ensemble Experiments of Convection-Permitting Climate Projections

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Over the last decade, researchers have devoted considerable efforts to exploring the feasibility of attaining convection-permitting scales in regional climate model projections. The primary objective has been to comprehend the effects of global warming on climate extremes. Initially conducted as isolated model experiments, these investigations have evolved into coordinated ensemble experiments operating at convection-permitting scales across diverse continents. The implementation of such coordinated ensembles has provided a platform for evaluating model reliability at high resolutions and conducting signal-to-noise analyses on identified climate change signals.

Nevertheless, the constraints imposed by limited computational resources have confined these experiments to smaller domains compared to the conventional continental scale employed in dynamical downscaling, as seen in initiatives like the CORDEX community and time slice mode.

Despite these inherent limitations, these experiments have successfully showcased the models' capacity to simulate present-day climate conditions. Notably, improvements in various statistical metrics at sub-daily scales have been observed in contrast to parametrized models. Furthermore, the ensemble approach has contributed to reducing uncertainties in assessing both present-day climate and future projections, particularly in terms of frequency, intensity, and extreme precipitation at the hourly time scale.

The explicit representation of convection has additionally enabled the study of convective storm system evolution, allowing for an assessment of large-scale feature changes and related physical mechanism driving observed extreme precipitation variations.

Preliminary attempts have also been carried on for building convection permitting climate

emulator to reduce the computational HPC demand required by the dynamical downscaling models.

These collective findings underscore the necessity of advancing to the next phase of coordination, involving the establishment of multiple coordinated platforms spanning different continents. These platforms will serve as collaborative spaces for discussing model enhancements, aiming to refine existing models by incorporating a more precise representation of Earth system components and defining domains that maximize the number of models capable of generating convection-permitting climate projections.