

Towards km-resolution global climate models: prospects and challenges

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Currently major efforts are underway toward refining the horizontal grid spacing of climate models to about 1 km, using both global and regional climate models (GCMs and RCMs). There is the well-founded hope that this increase in resolution will improve climate models, as it enables replacing the parameterizations of moist convection and gravity-wave drag by explicit treatments. Recent results suggest that this approach has a high potential to improving the representations of the water cycle and extreme events, and to reducing uncertainties in climate change projections. Developing the approach on global scales for extended climate simulations requires a concerted effort. Key challenges include the exploitation of the next generation hardware architecture using accelerators (e.g. graphics processing units, GPUs), the development of suitable approaches to overcome the output avalanche of high computational resolution, and the maintenance of source code on a number of different compute architectures. Despite these challenges, it will be argued that km-resolution GCMs, which are able to run at 1 SYPD (simulated year per day), might be closer than commonly believed.

The presentation is based on a recent collaborative paper (Schär et al., 2020, Kilometer-scale climate models: Prospects and challenges, BAMS, <https://doi.org/10.1175/BAMS-D-18-0167.1>) and ongoing studies.