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Regional projections of global climate change for local adaptation response.

Global climate models provide the large-scale picture of the climate and the climate change signal. Robust assessment of that signal is necessary at regional to local scales where the impact is felt and adaptation needs exist. This requires higher spatial resolution than global models can provide. Regional features such as steep orography, varying soil and vegetation properties, and small-scale landscape heterogeneities are strongly shaping the climate signal, including climate events and probabilities of short-term extremes. Regional climate models are applied downstream of the global models with enhanced grid resolution that allows for a more realistic regional climate response.

Improving regional climate models will be essential for

- regional-to-local climate information,
- planning of adaptation measures,
- assessing local consequences of mitigation measures, such as land use change for negative emission technologies,
- and for establishing regional and national climate services.

Challenges and gaps are

- better and more complex process descriptions at high and very high resolution at the km scale, as well as
- distillation of user-relevant information.

The value of downscaling for impact applications generally increases with resolution. Approaching the km scale promises distinctly improved representation of precipitation. Global climate models will not be able to provide operational km-scale resolution for decades.

The CORDEX community is providing coordinated sets of downscaled climate projections of regional and national scale climate that clearly add value to the underlying global climate projections. Downscaling is a critical component, and will be the primary source for climate services on regional and local level, even in coming decades, and thus needs further attention.