

Large- and local-scale drivers of regional climate change: contrasting RCMs and their driving GCMs

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Since establishment of the Coordinated Regional climate Downscaling Experiment (CORDEX) in 2009 large ensembles of regional climate model (RCM) simulations have become available for many regions worldwide. Analysis of climate projections in the CORDEX ensembles reveals that, at regional scale, future climate change generated by RCMs can be quite different, or even contrasting to, changes generated by their driving GCMs. Moreover, it is found that different RCMs downscaling the same GCM may produce contradicting future precipitation change. Taking such contradictions into account, one can argue that dynamical downscaling increases the range of uncertainties in climate projections. An alternative interpretation is that such contradictions in climate projections provide a useful insight into uncertainties in future regional climate change. It stands clear that some local-scale processes defined by RCM parameterisations may be much more important than large-scale drivers defined by the driving GCMs. Identification of such local-scale processes, responsible for different climate change signals, can provide crucial information for understanding drivers of regional climate change. We utilize a number of “contradicting examples” based on GCM and CORDEX RCM simulations from different CORDEX domains attempting to identify local-scale processes responsible for the contradictions. We also discuss how such “contradicting examples” can help in improvement of both global and regional climate models.