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Confidence in Lowered Southern Europe Temperature Projections due to Model Deficiencies

F. Boberg and J. Christensen
Danish Meteorological Institute, Copenhagen, Denmark (fbo@dmi.dk)

How anthropogenic climate change will affect the climate in dry and semi-arid regions has important implications for the course of regional development. It has become increasingly common to use high resolution regional climate models (RCMs) nested within coarser resolution global climate models (GCMs), to downscale climate change projections. The aim is to obtain physically consistent information about future climate with enhanced geographical detail. Recently, it has been demonstrated that RCMs share systematic temperature dependent biases, which affect their ability to capture accurately certain observable climate conditions. Here, we show that due to a broad tendency for climate models (regional and global) to show systematic biases in warm, dry climates, it is likely that, presently, many climate models overestimate regional amplification of global warming. We study Europe using the central Mediterranean as an example. To correct for individual model deficiencies, we apply a conditional bias correction method. The results demonstrate that projections of intense mean summer warming partly result from model deficiencies, and when corrected for, the Mediterranean summer temperature projections are reduced by up to one degree, on average by 10-20%. Individual models may be overestimating warming by several degrees.