Multi-scale climate modelling over Southern Africa using a variable-resolution global model

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Abstract

Evidence is provided of the successful application of a single atmospheric model code at time scales ranging from short-range weather forecasting through to projections of future climate change, and at spatial scales that vary from relatively low-resolution global simulations, to ultra-high resolution simulations at the micro-scale. The model used for these experiments is a variable-resolution global atmospheric model, the conformal-cubic atmospheric model (CCAM). It is shown that CCAM may be used to obtain plausible projections of future climate change, as well as skilful forecasts at the seasonal and short-range time scales, over the Southern African region. The model is additionally applied for extended simulations of present-day climate at spatial scales ranging from global simulations at relatively low horizontal resolution, to the micro-scale at ultra-high (1 km) resolution. Applying the atmospheric model at the shorter time scales provides the opportunity to test its physical parameterisation schemes and its response to fundamental forcing mechanisms (e.g. ENSO). The existing skill levels at the shorter time scales enhance the confidence in the model projections of future climate change, whilst the related verification studies indicate opportunities for future model improvement.

Keywords: multi-scale climate modelling, variable-resolution atmospheric model