Theoretical and Applied Climatology

Towards bridging the gap between climate change projections and maize producers in South Africa

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Abstract

Multi-decadal regional projections of future climate change are introduced into a linear statistical model in order to produce an ensemble of austral mid-summer maximum temperature simulations for southern Africa. The statistical model uses atmospheric thickness fields from a high-resolution (0.5° × 0.5°) reanalysis-forced simulation as predictors in order to develop a linear recalibration model which represents the relationship between atmospheric thickness fields and gridded maximum temperatures across the region. The regional climate model, the conformal-cubic atmospheric model (CCAM), projects maximum temperatures increases over southern Africa to be in the order of 4 °C under low mitigation towards the end of the century or even higher. The statistical recalibration model is able to replicate these increasing temperatures, and the atmospheric thickness–maximum temperature relationship is shown to be stable under future climate conditions. Since dry land crop yields are not explicitly simulated by climate models but are sensitive to maximum temperature extremes, the effect of projected maximum temperature change on dry land crops of the Witbank maize production district of South Africa, assuming other factors remain unchanged, is then assessed by employing a statistical approach similar to the one used for maximum temperature projections.