

Projected changes in tropical cyclone climatology and landfall in the Southwest Indian Ocean region under enhanced anthropogenic forcing

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Abstract

The conformal-cubic atmospheric model, a variable-resolution global model, is applied at high spatial resolution to perform simulations of present-day and future climate over southern Africa and over the Southwest Indian Ocean. The model is forced with the bias-corrected sea-surface temperatures and sea-ice of six coupled global climate models that contributed to Assessment Report 4 of the Intergovernmental Panel on Climate Change. All six simulations are for the period 1961–2100, under the A2 emission scenario. Projections for the latter part of the 21st century indicate a decrease in the occurrence of tropical cyclones over the Southwest Indian Ocean adjacent to southern Africa, as well as a northward shift in the preferred landfall position of these systems over the southern African subcontinent. A concurrent increase in January to March rainfall is projected for northern Mozambique and southern Tanzania, with decreases projected further south over semi-arid areas such as the Limpopo River Basin where these systems make an important contribution as main cause of widespread heavy rainfall. It is shown that the projected changes in tropical cyclone attributes and regional rainfall occur in relation to changes in larger scale atmospheric temperature, pressure and wind profiles of the southern African region and adjacent oceans.