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Influence of the topography of Madagascar on the South Indian Ocean Convergence Zone, the Mozambique Channel Trough and Southern African Rainfall

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The rainfall mean state and variability of the tropical Southern Hemisphere are strongly affected by the Tropical Convergence Zones. Unlike the South Pacific and South Atlantic, the topography of Madagascar prevents, through the Mozambique Channel Trough, the direct transport of moisture from the Indian Ocean toward southern Africa that feeds the South Indian Ocean Convergence Zone (SICZ).
By using regional climate models, we found that a flatter than the actual topography over Madagascar leads to a strengthening of the SICZ. Anomalously high easterly moisture fluxes are therefore transported from the Indian Ocean and the Mozambique Channel. These in turn trigger a significant increase in precipitation over southern Africa extending from Mozambique to Angola and a decrease in rainfall over Madagascar. These results have important implications for the improvement of the representation of southern African rainfall mean state and variability, which has been identified as a persisting issue in different generations of state-of-the-art climate models.