



Analysis and simulation of recent climate variability in the high-mountain regions of East Africa

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Kilimanjaro is the highest free-standing mountain in the world, and the glaciers at its summit represent regionally unique high-altitude sampling points in the troposphere. The region is influenced by, among other phenomena, the El Niño Southern Oscillation (ENSO), the Indian Ocean Zonal Mode, and the Quasi-Biennial Oscillation. However, the impacts of these phenomena as well as interactions between them on climate conditions in the high-mountain regions of East Africa are poorly constrained. Here we analyze recent high-altitude climate variability in East Africa using a combination of atmospheric reanalysis data, convection permitting (~ 1 km grid spacing) numerical simulations with the regional atmospheric model WRF, and multi-year in-situ weather station data at the summits of Mount Kenya and Kilimanjaro. We utilize these datasets to elucidate the impact of modes of internal climate variability, with a particular emphasis on ENSO, on both the large- and local-scale atmospheric conditions. Our analysis is compared with a ten-year record of glacier surface-height-change measurements on Kilimanjaro to elucidate the drivers of recent glacier response in East Africa.