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The impact of tropical cyclone activity in 2006/2007 on snow accumulation on Kilimanjaro

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Tropical cyclones represent an important component of intra-seasonal atmospheric variability in the southwestern tropical Indian Ocean, with between 3 and 13 occurrences annually since 1981. The associated rainfall and flooding can be devastating to local populations in eastern and southeastern Africa. Comparatively little is known about the impact of cyclones on precipitation patterns in the high-elevation regions of East Africa, in particular Kilimanjaro, and the relevant physical processes remain unexamined. Here, we use a combination of in situ measurements from the summit of Kilimanjaro and high-resolution (sub-kilometer) atmospheric modelling of the region to assess the impact of these storms between November 2006 and February 2007. Observational and modelling data indicate that single storms can produce accumulation amounts exceeding 10 cm at high-altitudes (5% of the average annual total) with a contribution from both direct and indirect moisture fluxes. Cumulative cyclone activity also represents an important signal in seasonal accumulation at the peak, indicating that synoptic-scale phenomena have the potential to induce a memory effect that could complicate the extraction of climate signals from glaciers.