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Comparison of tropical and subtropical glacier surface energy balance in Africa and South America

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Tropical glaciers exist only at high altitude, and meteorological and surface energy balance studies of these glaciers can tell us much about the conditions and changes occurring in the mid troposphere. Understanding the surface energy balance and resultant mass balance regime of tropical glaciers is prerequisite to predicting glacier evolution, and future meltwater contributions to local hydrological resources, in response to future climate scenarios. Tropical glacier mass balance variability is strongly linked to precipitation and, via this, to multi-annual climate oscillations such as ENSO and IOZM, so it is useful to understand what role these differing regional influences play in comparison to the similarities imposed by the overarching tropical climate conditions and seasonality.

New surface energy balance and mass balance data is available from Lewis glacier (Kenya, 0°09' S; 37°18' E), and here we use an energy and mass balance model to determine the surface energy flux characteristics at this site through a wet and dry season. Results are compared with those from Kersten glacier (Tanzania, 3°04' S; 37°21' E) to understand how conditions at these two glaciers compare and thus what coherent and contrasting climatic information glaciological records from these two sites can be expected to deliver.

Meteorological data available from glacier stations on Antizana (Ecuador, 0°25' S; 78°09' W), Artesonraju (Peru, 8°28' S; 77°38' W) Zongo (Bolivia, 16°39' S; 67°47' W) and Guanaco (Chile, 29°20' S; 70°00' W) glaciers in South America offer the opportunity to examine how the surface fluxes and seasonal variability of the energy balance compares to those of the African glaciers. We include the extra-tropical Chilean example for comparison with the similarly high altitude, cold ice of Kersten glacier.