Geophysical Research Abstracts
Vol. 15, EGU2013-3178, 2013
EGU General Assembly 2013

Tropical glaciers and climate dynamics: Resolving the linkages

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Large-scale atmosphere/ocean circulation and mountain glaciers represent two entirely different scales in the climate system. Therefore, statistical linkages between the two mask a cascade of processes that act on different temporal and spatial dimensions. Low-latitude glaciers are particularly well suited for studying such processes, since these glaciers are situated in the "heart" of the global climate system (the tropics). This presentation gives an overview of a decade of research on tropical climate and glaciers on Kilimanjaro (East Africa), which is, to our knowledge, the only case where space/time linkages between high-altitude glaciers and climate dynamics have been investigated systematically throughout the main scales. This includes the complex modification of atmospheric flow when air masses impinge on high mountains, an aspect that has been widely neglected from a cryospheric viewpoint. The case of Kilimanjaro demonstrates (1) the great potential of learning about climate system processes and their connections, (2) advances in our understanding of the importance of moisture for glaciers that lie far above the mean freezing level, and (3) methodological advances in combining atmospheric and cryospheric modelling.