The state of Kersten Glacier and the Northern Icefield on Mt. Kilimanjaro

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The glaciers on Kilimanjaro are unique indicators for climatic changes in the tropical mid-troposphere of Africa. Glaciers in the tropics have shown a severe retreat since the Last Glacial Maximum and the glaciers on Mt. Kilimanjaro are no exception, with an 85% reduction in glacier area from 1912 to 2013. This history of severe glacier area loss raises concerns about an imminent future disappearance. Yet, the remaining ice volume is not well known.

By combining state-of-the-art techniques from satellite remote sensing and glacier mass balance modelling with data assimilation, we inferred the glacier ice thickness of two selected glaciers on Mt. Kilimanjaro. We reconstruct thickness maps for 2000 and 2011 for the Northern Icefield and Kersten Glacier and find mean thickness values of 26.6 and 9.3 m for 2011, respectively. Model validation was difficult for Kersten Glacier, as no ice thickness measurements were available. Thus, the first attempt to use decadal retreat information, to infer past glacier ice thickness, which are used to do a glacier-specific calibration of the ice thickness reconstruction, was conducted by creating a generic margin thickness from glacier outlines and DEM differencing. This approach proved to be reasonable for Kersten Glacier, where a more common glacier type was assumed, but seemed to underestimate ice thickness at the Northern Icefield, because of the complex topography.

The poster summarizes the results obtained from the thickness reconstructions and compares them to thickness maps from an existing global consensus estimate. In comparison to our results the consensus estimate shows unrealistically thick values for KG in areas that are meanwhile ice-free. A rough projection on glacier recession based on the generated thickness data agrees with other estimates pointing towards the disappearance of the glaciers between 2040 and 2060.