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Historical glacier length fluctuations in West Greenland

P. W. Leclercq (1), A. Weidick (2), F. Paul (3), T. Bolch (3), M. Citterio (2), and J. Oerlemans (1)

(1) IMAU, Utrecht University, Utrecht, Netherlands (p.w.leclercq@uu.nl), (2) Geological Survey of Denmark and Greenland, Copenhagen, Denmark, (3) Department of Geography, University of Zurich-Irchel, Zürich, Switzerland

Knowledge of past glacier fluctuations provides insight into glacier dynamics and the sensitivity of glaciers to climate change. In addition, historical glacier fluctuations can be used to reconstruct past climate fluctuations and the contribution of glaciers to the sea-level rise observed since the middle of the 19^{th} century. For many regions of the world information of glacier fluctuations over the past centuries has become available, mostly in the form of measured and reconstructed glacier length fluctuations. However, for the glacierized regions in the Arctic, information has remained scarce. As these regions contain the largest part of the world's glacier area and volume, this lack of information hampers the reconstruction of the glacier contribution to sea-level rise.

Here, we present the length fluctuations of 18 glaciers in West and South Greenland, extending the information available from the study by Weidick (1968). The glaciers are so-called local glaciers, i.e. they are not part of the main ice sheet, and clustered in three regions: Julianahåb and Godthåb, Sukkertoppen, and Disko Island and the Nuussuaq peninsula. The records of glacier length fluctuations are based on a compilation of information from historical documents, field observations, aerial photographs, and Landsat images. The records cover the 20^{th} and part of the 19^{th} century, starting between 1811 and 1900 (on average in 1853) and ending in recent years (2008–2010). The number of data points per record varies between 6 and 13, with a mean of 10 observations per record. All studied glaciers show an overall retreat under the period of observation, indicating a general rise of the equilibrium line altitude along the west coast of Greenland during the last century.