



Extracting a climate signal from glacier length records

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The world-wide retreat of many glaciers during the last few decades is frequently mentioned as a clear and unambiguous sign of global warming. Recent glacio-meteorological field experiments and modelling studies have led to a much improved understanding of the link between climate processes and glacier mass balance. Yet, the climatic information contained in records of glacier geometry, particularly glacier length, has only partly been exploited. A temperature history for different parts of the world has been constructed from 169 glacier length records. Some of these records start around 1600, the majority in the late 19th century. Using a first-order theory of glacier dynamics, changes in glacier length were related to changes in temperature. The derived temperature histories are fully independent of proxy and instrumental data used in earlier reconstructions. The analysis shows that moderate global warming started in the middle of the 19th century. For the period 1860 - 1900, 36 glacier length records are available; 35 glaciers showed net retreat. The reconstructed warming in the first half of the 20th century is 0.5 K. This warming was remarkably coherent over the globe. The warming signals from glaciers at low and high elevations appear to be very similar