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Reconstructing the ∼AD 1900 extent of glaciers in Nordland, northern Norway, from historical maps

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Glaciers are important indicators of climate change. Monitoring variations in glacier extent from repeated glacier inventories allows an assessment of changes in climate over time. In Norway, glacier inventories have previously been created from topographic maps for the period 1947-1985 and from Landsat imagery for the periods 1988-1997 and 1999-2006. This study reconstructs the ∼AD 1900 (1882-1916) glacier extent in the northern Norwegian county of Nordland from historical maps, adding to the existing inventories. Glacier outlines were digitised from georectified images of the analogue maps in a graphics programme employing a semi-automated procedure. The outlines were then compiled in a GIS, divided into glacier units and assigned ID numbers to enable comparison to existing inventories. The accuracy of the glacier extent on the historical maps was validated against written descriptions and landscape photos produced during the ∼AD 1900 field mapping campaigns as well as against independent geomorphological evidence and old air photos. The new data set reveals that substantial changes in the extent of Nordland's glaciers have occurred since the end of the 19th century. Between ∼AD 1900 and 1999-2006, the three largest ice masses in Nordland, Vestre and Østre Svartisen and Blåmannsisen, decreased in overall size by 19.8 to 31.0 % alone. The study demonstrates the value of historical maps for extending existing inventories further back in time, improving understanding of 20th-century glacier change.