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Evolution of the Norwegian plateau icefield Hardangerjøkulen from the Little Ice Age to present

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Plateau icefields are particularly susceptible to climate change because a small rise in equilibrium line altitude (ELA) can lead to a significant expansion of the ablation area, triggering rapid icefield recession. Several modelling studies have simulated the past and future evolution of the Hardangerjøkulen icefield in southwestern Norway and demonstrated its sensitivity to changes in climate. However, these studies would benefit from robust and independent field observations and proxy data on the glacial record to help calibrate and validate the models. This study reconstructs the Little Ice Age (LIA) extent of Hardangerjøkulen and its subsequent recession based on the glacial landform record. Geomorphological mapping of glacial landforms was carried out in the field and from aerial photographs in order to produce a detailed geomorphological map of the icefield. Hardangerjøkulen's maximum LIA position was established using ice-marginal moraines, glacial drift limits, trimlines, and identifiable erosion and weathering boundaries. The icefield's post-LIA recession was reconstructed from moraine evidence. Glacier outlines extracted from historical maps and old vertical aerial photographs were used to help establish a chronology for the reconstructed recession patterns. The landform record at Hardangerjøkulen indicates that the main outlet glaciers of the icefield have lost in the order of 12.4 to 25.0 % of their area since the LIA maximum. The new reconstruction can be used to help predict the effect of future climate change on the recession dynamics of Hardangerjøkulen and similar ice masses worldwide. The reconstruction can also serve as a benchmark against which future models of the icefield can be compared and validated.