



Modeling of the 20th and 21st century evolution of Hoffellsjökull, a southeast outlet glacier of Vatnajökull ice cap, Iceland

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The maximum extent of glaciers in Iceland was reached about 1890 AD and during the 20th century most of the glaciers have been retreating. A model for the mass balance and flow of glaciers is used to reconstruct the 20th century retreat history of the outlet glacier Hoffellsjökull which is located close to the southeast coast of Iceland. The topography of the bedrock was surveyed by radio-echo sounding in 2001. A wealth of other data have been collected to force and constrain the model; e.g. surface maps from ~1890, 1904, 1936, 1946, 1986, 2001 and 2008, mass balance observations conducted in 1935–1938 and after 2000, energy balance measurements after 2000, and velocity observed with DGPS and obtained through correlation of SPOT5-HRG images. The 20% volume loss of this glacier in the period 1890–2008 is well simulated with the coupled model. Having calibrated the model with past observations, it is used to simulate the future response of the glacier during the 21st century. The mass balance model was forced with an ensemble of temperature and precipitation scenarios from a collaborative project to study the effect of climate changes in the Nordic countries (the CES project). If the average climate of 2000–2010 is maintained, the volume is projected to be reduced by 30% with respect to the present at the end of this century, and the glacier will almost disappear if the climate warms as suggested by most of the climate change scenarios. Runoff from the glacier is predicted to increase for the next 30–40 years and decrease after that as a consequence of the reduction in the ice-covered area.