

Abstract

The primary idea of this work is to provide a complement to the mass-balance fluctuations of the Upper Grindelwald Glacier found by [Luetscher et al. \(2011\)](#) using the Open Global Glacier Model (OGGM). Therefore, the main objective of this thesis is to calibrate and validate the model for further use.

The OGGM is the first flowline model which provides a complete automated process and can therefore easily compute past and future states of glaciers world wide. It is characterised by its simple but innovative approach to the mass-balance, based upon [Marzeion et al. \(2012\)](#). Idealised experiments give an insight into the general model behavior and its sensitivities to different boundary conditions, and they reveal that the ice flux depends solely on the ice thickness. Being calibrated with historical climate data, a digital elevation model and the glacier outline, the model is able to simulate the glacier evolution from 1879 to present. The geometric parametrisation of the parabolic bed is enhanced after validating the outcome with GRP measurements and past lengths changes. The results are reasonable, although the model tends to an overestimation of retreats.

The observed changes of ice thickness near the entrances of the Milchbach cave system at the lowermost part of the glacier can partly be reproduced, even though the spatial positioning along the flowline is not perfect. It is found that the entrances open between 2004 and 2011 which matches reality, except for the uppermost entrance. The results suggest that further and more detailed studies can be performed with the applied calibration regarding past and/or future glacier developments.

The main concern for future work with the OGGM should be to find a solution which enables to compute past glacier outlines to enhance the “backwards” modelling.