Non-linear flow law of rockglacier creep determined from geomorphological observations: A case study from the Murtèl rockglacier (Engadin, SE Switzerland)

Introduction

The creep behavior (i.e., rheology) of rockglaciers may deviate from the well-known linear flow law for pure ice. Here we aim at constraining the non-linear viscous flow law governing rockglacier creep based on geomorphological criteria and borehole deformation data. As a case study we use the Murtèl rockglacier (Engadin valley, SE Switzerland) for which high-resolution digital elevation models (DEM) from borehole deformation data and geological sounding exist that allow the exterior and interior architecture and dynamics of the rock glacier to be constrained.

Rockglaciers often feature a prominent furrow-and-ridge topography. For the Murtèl rockglacier, Frehner et al. (2015) reproduced the wavelength, amplitude, and distribution of the furrow-and-ridge morphology using a linear viscous (Newtonian) model. It is expected that the wavelength, amplitude, and distribution of the furrow-and-ridge morphology (Fig. 1) depend on the power-law exponent of the non-linear rheological flow law.

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