EGU2020-17850
https://doi.org/10.5194/egusphere-egu2020-17850
EGU General Assembly 2020

Numerical sensitivity analysis of a rock glacier flow model versus detection of an internal sliding occurrence

Daniela Mansutti[1], Krishna Kannan[2], and Kumbakonam R. Rajagopal[3]
[1]Istituto per le Applicazioni del Calcolo, C.N.R., Roma, Italy (d.mansutti@iac.cnr.it)
[2]Dept. Mech. Engrng., Indian Institute of Technology, Madras, India
[3]Dept. Mech. Engrng., University of Texas A & M, College Station, USA

This work concerns the rock glacier flow model introduced, in its basic form, by Kannan and Rajagopal in [1] and extended with inclusion of temperature effects by Kannan, Rajagopal, Mansutti and Urbini in [2]. This one is based on the general conservation laws (momentum, mass and energy) and takes into account the effect of shear rate, pressure and rocks and sand grains volume fraction onto viscosity, also by implementing the effects of local pressure melting point variation. Here we present the results of a sensitivity analysis of the parameters developed by shooting the location of the internal sliding occurence, induced by the presence of rocks and sand grains trapped within the interstices of the glacier, and the value of the shear velocity. The case of the Murtel-Corvatsch glacier in Switzerland is considered for the availability of the detailed description based on measured data published by Arenson, Hoelzle and Springman in [3].
The numerical results obtained improve those ones presented in [1] and show clearly the contribution of each numerical and functional parameter of the model. They also exhibit a very good agreement with observations which makes this modelling approach very promising for general application.
[1] Kannan, K., Rajagopal, K.R.: A model for the flow of rock glaciers. Int. J. Non-lin. Mech., 48, pp. 59– 64 (2013)
[2] Kannan, K., Mansutti, D., Rajagopal, K.R. and Urbini, S.: Mathematical modeling of rock glacier flow with temperature effects, in Mathematical Approach to Climate Change and its Impacts (P. Cannarsa, D. Mansutti and A. Provenzale, eds.), pp. 137-148, Springer-INDAM series, vol.38 (2020)
[3] Arenson, L., Hoeltzle, M. and Springman, S.: Borehole Deformation Measurements and Internal Structure of Some Rock Glaciers in Switzerland. Permafrost and Periglacial Processes, 13, pp. 117-135 (2002).

Acknowledgements: D. Mansutti acknowledges Piano Nazionale Ricerca Antartide (PNRA) for financial support of this topic within the project ENIGMA (project PNRA$16-00121$).