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Numerical simulations of Gurenhekou Glacier on the Tibetan Plateau using a full-Stokes ice dynamical model

L. Zhao (1), L. Tian (2,3), T. Zwinger (1,4), R. Ding (1), J. Zong (2), Q. Ye (2), J. C. Moore (1,5,6)

(1) College of Global Change and Earth System Science, Beijing Normal University, Beijing 100875, China, (2) Key Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100085, China, (3) State Key Laboratory of Cryosphere Sciences, Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou 730000, China, (4) CSC-IT Center for Science Ltd., Espoo, Finland, (5) Arctic Centre, University of Lapland, P.O. Box 122, 96101 Rovaniemi, Finland, (6) Department of Earth Sciences, Uppsala University, Villavägen 16, Uppsala, SE-75236, Sweden

Gurenhekou Glacier is a small alpine glacier that lies in the Yangbajain area of Nyainqentanglha Range of the southern Tibetan Plateau between 5500-6000 m a.s.l. No Tibetan glaciers have to date been modeled using state-of-the-art ice dynamics models, yet these glaciers supply water to many millions of people. Observation shows that this glacier, in common with many others on the Tibetan Plateau, has retreated rapidly in the past 30 years. In this study, a three-dimensional, thermo-mechanically coupled full-Stokes model is applied to Gurenhekou Glacier. The model is solved by using the open source finite-element package Elmer (http://www.csc.fi/elmer/). The digital elevation model (DEM) is set up using the data from the year 2007 to 2009, we also use ground penetrating radar date profiles of the ice bedrock from 2007. Temperature at glacier surface is estimated by using the annual mean air temperature from 9 automatic weather stations located in DangXiong County nearby. The geothermal heat flux at the bedrock is approximated by using a measured temperature profile of another glacier on the Tibetan Plateau. We present both steady state and transient types of simulations using predicted temperature and precipitation scenarios. The goal of this study is to predict the dynamical change of Gurenhekou glacier over the next decades.