Project Title: Thermo-mechanical modelling of rock-ice avalanches for large scale hazard indication mapping in Uttarakhand Province, India

Abstract:

This is a joint Indo-Swiss collaborative project between CSIR-CBRI, Roorkee and WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland sponsored by Swiss Agency for Development and Cooperation (SDC). In this project, it is proposed to apply large scale hazard indication mapping algorithms to the Himalayan province of Uttarakhand. The goal is to identify unstable rock/ice masses and perform thermo-mechanical simulations – at the large scale – to predict the danger of rock/ice avalanches, such as the Chamoli event in 2021. The aforementioned events also underscore the danger arising from secondary processes, such as damming of rivers and subsequent flooding that can occur after the initial event. The prediction of "cascading" processes is often the primary problem in hazard mitigation. The formation of follow-up flows is a highly complex geo-mechanical problem involving thermo-mechanical processes such as melting of ice/snow and the entrainment of debris, ice, snow, water and other material such as tree trunks, especially in high-mountain regions around the world. International collaboration in this field is desperately needed to examine a widest possible range of case-studies outside the boundaries of each individual country. By exchanging and modelling case studies, we strive to improve models of rock/ice avalanches such that they can be used in a predictive way. Testing models in different terrain and site-conditions improves model reliability, assessment of model uncertainties and the specification of entrainment involving snow, ice and water. Above all, it allows large scale applications favouring safe and sustainable land use.

Objectives:　　1. Thermomechanical Simulation of Case Studies
　　　　　　　　　2. Characterization of Source and Entrainment Areas
　　　　　　　　　3. Large Scale Hazard Indication Mapping of Uttarakhand