Name of research institute or organization:

Institut für Umweltphysik (IUP), Universität Heidelberg

Title of project:

Glaciological and geophysical survey at Colle Gnifetti glacier for improved 3D flow modelling and ice core interpretation

Part of this programme:

REKLIM

Project leader and team:

Carlo Licciulli, project leader
Field team: Dr. Helene Hoffmann, Josef Lier, Lars Zipf
Dr. Pascal Bohleber

Project description:

The cold glacier saddle Colle Gnifetti (CG), Monte Rosa massif, 4450 m asl, is the unique drilling site in the European Alps offering continuous ice core records on a millennial year time scale. First ice core studies at CG have been performed already in the late Seventies, whereas the first ice core reaching bedrock has been recovered in 1982 by a team from the University of Bern and the University of Heidelberg (Institut für Umweltphysik, IUP).

The last ice core drilling project (KCC) led by the IUP dates back to summer 2013 and employs a unique approach of combining multiple state-of-the-art methods in ice core analysis: new ultra-high resolution impurity analysis for detecting highly thinned annual layers; micro-radiocarbon dating of basal ice; ice crystal-orientation fabric analysis on the cm-scale; and 3D full Stokes numerical ice flow modeling of the entire glacier saddle.

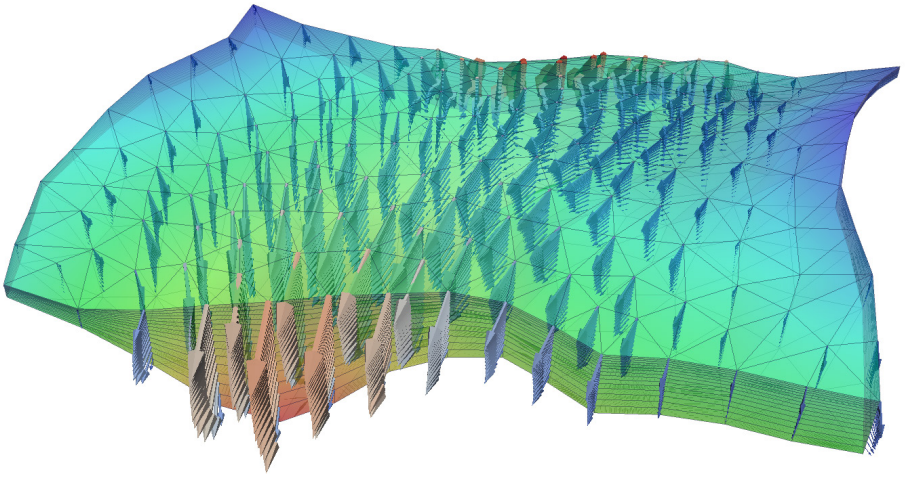

Figure 1. 3D visualization of the glacier geometry implemented in the numerical ice flow model. The arrows represent the modeled ice flow field.

The full interpretation of the ice core records, and in particular modeling the ice flow, requires an accurate knowledge of the glaciological settings and boundary conditions of the glacier. In the period 2014-2016, three field campaigns, led by IUP-members with the collaboration of the University of Fribourg, provided new measurements of the glacier surface topography and surface flow velocities, snow net accumulation and englacial temperatures. The campaign performed over the course of four days in September 2016 aimed specifically at retrieving additional important constraints on bulk flow velocities by

measuring inclination angles of old still accessible deep boreholes. In addition, new data about internal structure of the glacier and bedrock topography have been obtained by means of ground-penetrating radar (GPR) measurements.

In this context the facilities at Gornergrat, situated at about 3100 m asl, offer invaluable support to accomplish field campaigns at CG. First and foremost this concerns the safety of the participants by allowing them to easily reach high altitude locations for an overnight stay and perform altitude acclimatization step-by-step.

Figure 2. Field work activities at CG during the campaign of September 2016. Left: borehole inclination measurements. Right: GPR and surface topography measurements.

Key words:

Glaciology, numerical ice flow modeling, high altitude acclimatization

Internet data bases:

www.iup.uni-heidelberg.de

Collaborating partners/networks:

Uni Fribourg, KUP Uni Bern, Elmer/Ice

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