

alpS

alpS - Centre for Climate Change Adaptation

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: K1-Centres/K-Projects

COMET subproject, duration and type of project:
MUSICALS II, 04/2014 – 03/2017, multi-firm

Future water availability: The project MUSICALS

Snow and ice play a key role in the water balance of alpine regions. The accumulation and melt of snow is crucial for many sectors such as hydropower generation and tourism in Austria. Due to recent changes in climatic conditions as proven by increasing temperatures in the last decades, a retreat of glaciers and shifts in seasonality of river discharge have been observed. It is expected that climate change will continue to affect the availability of water resources in space and time. MUSICALS II seeks to understand the mechanisms and dynamics of these changes in order to provide quantitative information on future states of water availability.



Water availability: A glance into the future

The availability of water in space and time is explicitly addressed in the project MUSICALS II through considering time scales ranging from months to decades. Seasonal predictions aim at providing information about outlooks of snow water equivalent and runoff of the upcoming season. In contrast to weather forecasts, these seasonal predictions are less accurate but they gain insight into possible deviations from normal conditions. In contrast, climate predictions of snow, glacier extents, and runoff are based upon climate scenarios considering possible changes of the climate in the future mainly based on assumptions of green house gas emissions. Both time frames serve as base for decision making.



Seasonal predictions: Can we expect a snow-poor winter?

A prototype system for predicting snow water equivalent and runoff for the upcoming season

has been developed and is currently being tested. This system predicts average temperature and precipitation for the next 9 months based on available climate forecasts. Subsequent water balance simulations put light on water availability. Simulations issued in October 2015 correctly predicted the above average temperatures in the winter season 2015/16. These forecasts might serve as a base in decision making for the company partner's day-to-day routine.



Fig. 1: Glaciers are important sources of runoff in the alpine water balance (K. Förster, alpS)



How does climate change affect the alpine water balance?

At present, retreating glaciers lead to a surplus in water availability. As this recently observed increase in temperature will result in further shrinkage of glacier volumes, a subsequent decline in water availability due to the reduced glacier areas is likely. Based on climate model simulations that rely on scenario assumptions, coupled water balance and glacier simulations carried out in MUSICALS II support this expectation. First results indicate that the “moment of peak discharge” (i.e. the tipping point when the surplus in runoff will decline due to retreating glaciers) has not been reached yet in Tyrol. Through considering numerous scenarios, possible future developments are being studied.

In order to bridge the gap between the availability of climate data in terms of temporal resolution and the requirements of the water balance simulations, an open source tool called MELO-DIST has been developed and released to the public.

These long-term predictions help the company partner.

The long term simulations help on the one hand the company partners to improve long-term planning with respect to operation and design of hydropower plants, on the other hand in the development and validation of new methods and software solutions for snow and ice physical applications.



Impact and effects

Both seasonal predictions and scenario-based simulations of water availability serve as a quantitative base in order to develop climate

change adaptation strategies. Predictions at the seasonal time scale help in decision making with respect to the upcoming seasons, whereas scenario-based climate simulations used as input for the coupled water balance and glacier simulations provide quantitative information for adaptation strategies for the next decades. This information is not only relevant for the company partner’s needs. Moreover, the knowhow gathered in MUSICALS II is also applied in the field of international consulting for analysing the long-term viability of projected hydropower plants worldwide.

Retreating glaciers and the changes in water availability related to this are also relevant for the society as a whole since the topic addressed is also important with respect to many socio-economic aspects such as carbon free energy production, value creation, and employment, to mention only a few. MUSICALS II also contributes to current scientific discourse through dissemination of results in scientific journals.

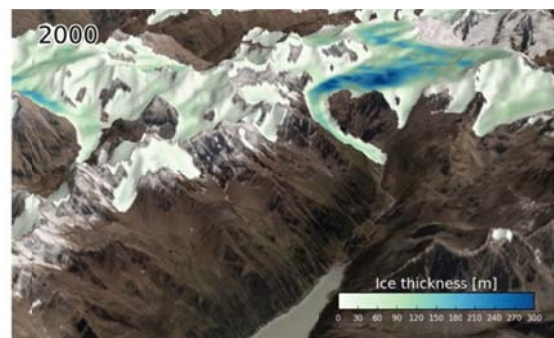


Fig. 2: Results of an ice thickness simulation showing water resources stored in glaciers (alpS)

Contact and information

K1-Centre alpS

alpS GmbH

Grabenweg 68, A-6020 Innsbruck

T +43-(0) 512-392929-0

E info@alps-gmbh.com, www.alps-gmbh.com

Project partners

Organisation	Country
University of Innsbruck	Austria
Vienna University of Technology	Austria
TIWAG - Tiroler Wasserkraft AG	Austria
ALPsolut S.r.l.	Austria
Wyssen Austria GmbH	Austria

Project coordinator

Dr. Matthias Huttenlau

Further information on COMET – Competence Centers for Excellent Technologies: www.ffg.at/comet

This success story was provided by the consortium leader/centre management for the purpose of being published on the FFG website. FFG does not take responsibility for the accuracy, completeness and the currentness of the information stated.