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# **SnowHydro 2020**

## International Conference on Snow Hydrology Challenges in Mountain Areas

**28<sup>th</sup> – 31<sup>st</sup> January 2020**

Eurac Research, Bolzano/Bozen, Italy

**ABSTRACT BOOK**



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## International Conference on Snow Hydrology Challenges in Mountain Areas

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### Responsible organizers

Claudia Notarnicola – EURAC Research (Italy) – Scientific coordinator

Giacomo Bertoldi – EURAC Research (Italy) – Scientific advisor

María José Polo – University of Córdoba (Spain) – Scientific advisor

Lucas Menzel – University of Heidelberg (Germany) – Scientific advisor

Paola Winkler - EURAC Research (Italy) – Project manager

### Venue

EURAC, lecture room “Auditorium”.



## **Modelling spatio-temporal dynamics of snow depth and large herbivore's winter habitat selection**

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Winter snowy conditions and the wildlife management strategies they encourage play a critical role in governing the spatial distribution of ungulates in temperate ecosystems. Snow depth severely restricts roe deer (*Capreolus capreolus*) distribution due to the limitations resulting from their small body mass (18-49 kg: Lister et al,1998) and short legs (50-60 cm: Holand et al. 1998). Due to these constraints, roe deer living in snowy areas adopt highly selective movement tactics. For instance, roe deer employ a partial migration strategy, with all individuals overwintering in ranges characterized by less extreme snow conditions, and some migrating in summer ranges which are usually at higher elevations. Recently, Brigh Bross et al (2019) examined how wintertime snow depth trends and increases in supplemental feeding practice affect habitat selection by roe deers in an alpine area, a region at the species' elevational range limit that is experiencing rapid climate change. This study has required a detailed estimation of snow cover spatio-temporal patterns. Therefore, GEOTop Hydrological Model Holand et al. 1998, Bortoli et al, (2019, in preparation, [www.geotop.org](http://www.geotop.org)) has been used and applied to the study case. GEOTop is a water- and energy-balance model that produces snow depth area maps from meteorological data, taking into account snow melting processes across the landscape. GEOTop executes simulations in continuum in small or relatively large mountain catchments. GEOTop deals with the effects of topography on the interaction between energy balance (evapotranspiration, heat transfer) and hydrological cycle (water, glacier and snow). 25-year long time series of weather data time collected in several stations through the study area are taken into account: in particular simulations has been run with observed data and both estimated data downscaled by regional climate model projections (COSMO-CLM, Rockel et al. 2008) in order to generate two further hypothetical 25-year long series corresponding to the two IPCC scenarios RCP 4.5 and RCP 8.5 . GEOTop has been validated with measurements collected in the sampling plots during field campaigns in 2012-2013 and 2013-2014 winters (Ossi et al,2015). Results show that snow occurrence at medium and low elevations , i.e the number of days with snow cover (snow depth > 5 cm) from December to April, in the decade 2006-2015 (latest year of the analysis) is more variable than in the past decade 1996-2005. Snow occurrence simulated with the climate projections confirm these outcomes. Furthermore, roe deers in presence of snow strongly try to select zones with canopy cover and avoid places with high snow depths. Therefore, interplay between selection of habitats in winters and changing spatio-temporal pattern of snow depth affected by increasing climate variability constitutes a challenge to future research in animal ecology and is a field of interest for applied snow hydrology.