Submitted Abstract

ID IMC22-FSAbstr- 714

First Author First Name Last Name	 Albin (1) Hammerle
Submitting Author First Name Last Name	 Albin Hammerle
Correspondence	albin.hammerle@uibk.ac.at
Co-Authors **>> E-Mails will be not listed**	Tasser, Erich (1,2); Matiu, Michael (3); Wohlfahrt, Georg (1)
Organisations	1: University of Innsbruck, Departement of Ecology, Innsbruck, Austria 2: Eurac Research, Institute for Alpine Environment, Bozen/Bolzano, Italy 3: Eurac Research, Institute for Earth Observation, Bozen/Bolzano, Italy
Country	Austria
Region	Western Europe
Title	Albedo-Mediated Interactive Effects Of Land- And Snow Cover Changes On The Radiative Forcing In Northern Italy.
Keywords	Albedo Change, Snow Cover Change, Land Use Scenarios
Type	List Of Focus Session
Focus Session ID	61

Abstract

The Alps are experiencing large climatic and socio-economic changes. Climate change is leading to an above-average increase in temperatures and subsequent changes in the timing and duration of snow cover. In parallel, socio-economic changes are affecting land use in the Alpine region. Both, snow cover duration/timing and land use changes directly affect the surface albedo of this landscape and therefore the energy balance of this region. Globally, changes in surface albedo due to land use changes and changes in snow/ice cover affect surface albedo, and thus radiative forcing, in opposite directions.

In this study, we investigated the impact of five different future land use scenarios, 12 future snow cover scenarios on the surface albedo in the alpine region of South Tyrol (Italy) in the year 2100 compared to conditions in 2010. Both, the individual effects of changes in land use and future snow cover patterns were investigated, as well as the interactive effects of these two processes.

The hypothetical changes in albedo until 2100 associated with changes in land and/or snow cover were assessed by establishing a surface albedo model based on remotely sensed albedo (MODIS MCD43A1), snow cover data (MODIS MOD10A1), land cover data, as well as geographical information (ASTER ASTGTM). Four potential future land covers were developed on the basis of likely socio-economic pathways as well as one hypothetical scenario and their spatial distribution was mapped. Snow cover scenarios for 2100 are based on EURO CORDEX RCP 2.6 and 8.5 climate scenarios.

Snow cover was by far the most important predictor for albedo, followed by the occurrence of needle leaf forests using a regression tree algorithm, which exhibited excellent skill in modelling current albedo conditions based on the above-mentioned predictors.

All likely future land cover scenarios caused similar increases in spatially averaged albedo of the study domain, while likely future snow cover conditions lead to a decrease in average albedo, the magnitude of which depended on the chosen RCP and combination of global/regional climate model. Simulations with factorial combinations of land cover and snow cover scenarios somewhat moderated the decrease in albedo caused by the snow cover changes, but in no case likely land cover changes compensated for the albedo decrease caused by snow cover changes. Only the hypothetical, unrealistic scenario with a dramatic decrease in forest areas increased the average albedo.