EGU21-2120, updated on 20 Oct 2021
https://doi.org/10.5194/egusphere-egu21-2120
EGU General Assembly 2021

Climate forcing due to the snow albedo effect in the regional climate models from the CORDEX Flagship Pilot study LUCAS.

Anne Sophie Daloz[1], Clemens Schwingshackl[1], Priscilla Mooney[2], Susanna Strada[3], Marianne T. Lund[1], Marcus Breil[4], Rita M. Cardoso[5], Edouard Davin[6], Peter Hoffmann[7], Elena Katragkou[8], Daniela C.A. Lima[5], Rony Meier[6], Nathalie de Noblet-Ducoudre[9], Diana Rechid[7], Pedro M. M. Soares[5], Giannis Sofiadis[8], Gustav Strandberg[10], and Merja H. Toelle[11]

[1]CICERO, Climate System, Oslo, Norway (anne.sophie.daloz@cicero.oslo.no)
[2]Bjerknes Centre for Climate Research, Bergen, Norway
[3]International Center for Theoretical Physics, Trieste, Italy
[4]Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany
[5]Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal
[6]Eidgenössische Technische Hochschule Zürich, Zurich, Switzerland
[7]Climate Service Center Germany, Helmholtz-Zentrum Geesthacht, Hamburg, Germany
[8]Department of Meteorology and Climatology, School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece
[9]Laboratoire des Sciences du Climat et de l'environnement, Paris, France
[10]Swedish Meteorological and Hydrological Institute, Norrkoping, Sweden
[11]Department of Geography, Climatology, Climate Dynamics and Climate Change, Justus-Liebig University Giessen, Germany and CESR, University of Kassel, Germany

In the Northern Hemisphere, the seasonal snow cover plays a major role in the climate system via its effect on albedo and surface fluxes, influencing the variations in near surface temperature. Across climate models, the parameterization of the snow-albedo relationship remains a source of high uncertainty, often leading to large biases in the representation of local and global climate.

In this work, we analyze regional climate model outputs from the flagship pilot study (FPS) Land Use and Climate Across Scales (LUCAS) of the European branch of the Coordinated Downscaling Experiments EURO-CORDEX. These experiments include land use change forcing to identify robust biophysical impacts of land use changes on climate across regional to local spatial scales and at various time scales from extreme events to multi-decadal trends.

Here, we evaluate the ability of this ensemble of regional climate models combined with different land surface models to capture the climate forcing from the snow albedo effect in Europe, by comparing their representation of the Snow Atmosphere Sensitivity Index (SASI) with reanalyses and satellite observations. A specific focus is given to three sub-regions: Scandinavia, East Baltic and East Europe. For all regions, during the accumulation period, the models tend to largely agree on the representation of SASI. However, during the ablation period, there are large disparities, which are related to differences in the representation of the snow cover fraction in the models. This suggests that the choice of the land model is more critical for the representation of the

climate forcing from the snow albedo effect than the atmospheric model. These differences in SASI leads to discrepancies in the simulated surface temperature.