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Modelling the impact of land use and climate changes at the regional scale

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The climate is affected by greenhouse gas emissions, but also by land use and land cover changes (LULCC). A wide range of climate change scenarios exists, but the development of LULCC scenarios is more recent. Accordingly, the global CMIP5 climate simulations were created using changes in the land surface as forcing data. However, the LULCC forcing is expected to be larger at smaller scales than at the global scale. Regional climate models coupled with land surface models are suitable tools to study the impact of LULCC on the regional climate.
We dynamically downscale the ERA-Interim reanalysis data using the regional climate model ALARO-0 coupled to the land surface model SURFEX. We analyse the impact of land surface changes on the Western European climate by applying the three socio-economic storylines that were developed within the ALARM project. These storylines were established within the need to evaluate the future direction of the socio-economic changes with their impact on the land, as the European territory is under the influence of many drivers of change. The largest land changes contain the abandonment of agricultural land and the increase in forestry and urban areas.
The impact of the LULCC are evaluated with respect to the impact of climate change. The ALARO-0 model coupled to SURFEX is forced towards the RCP scenarios for the future climate using CMIP5 climate simulations. This way we can identify the regional differences in the intensity of the land use and climate change. Nonetheless, future research could focus on the combined effects of land use and climate change, as these interactions are still poorly understood.