

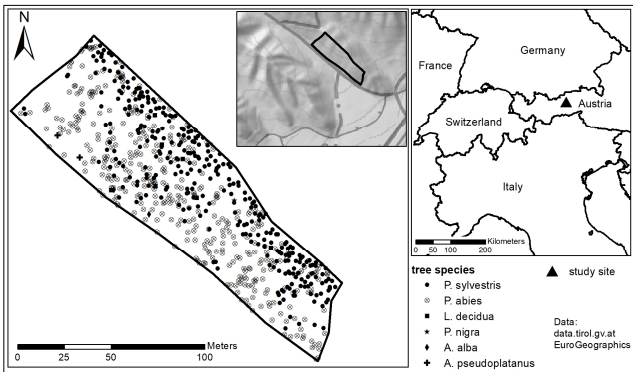


modelling climate-sensitive forest succession

effects of 3 climate scenarios and mixed tree species composition on a forest are presented

motivation

Considering the trend of temperature increase, mountain forests are likely to undergo a dramatic change in the next centuries. The research encourages the adaption of forests to climate change for future stable forest stands and sustainable yield. It assesses the impacts of climate change to support decision making.



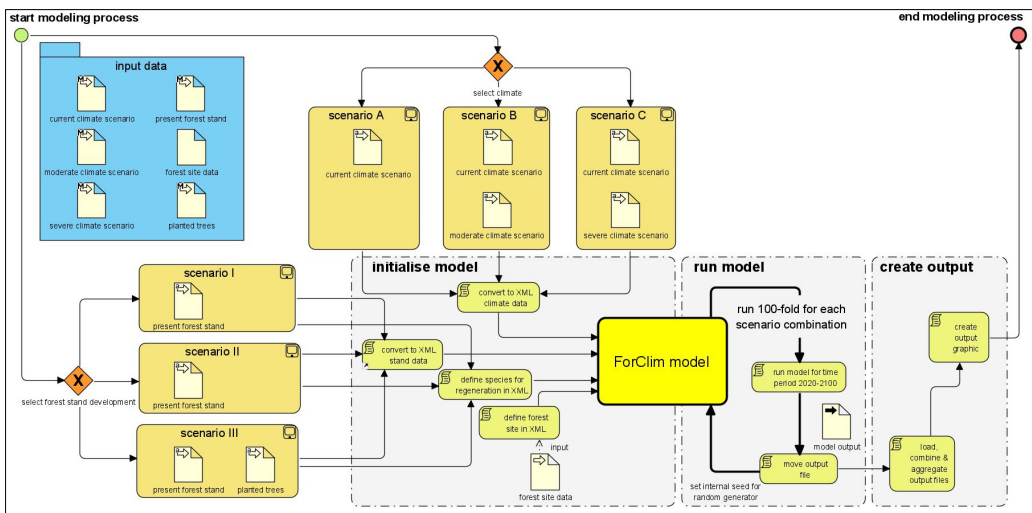
Location of the study site and tree species distribution of the present forest stand.

resources

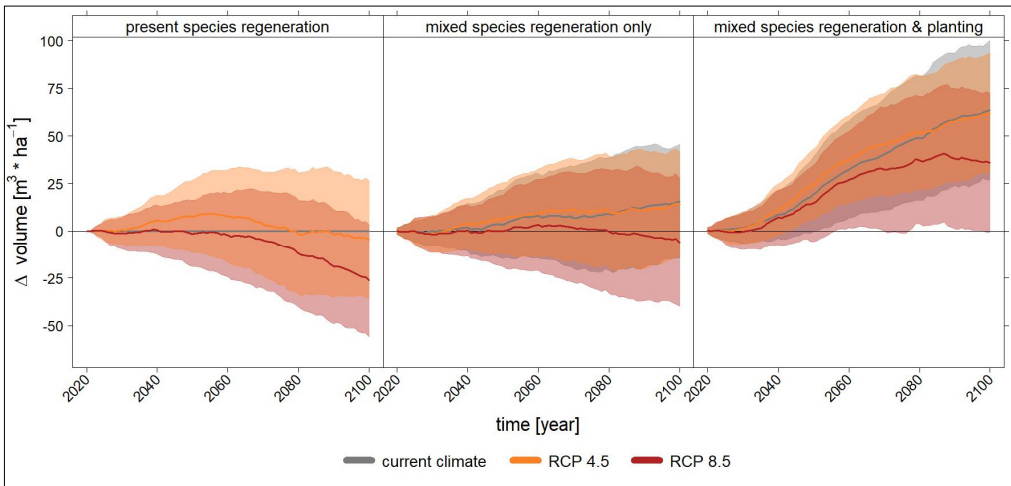
- ÖKS 15: climate change datasets provided by the Climate Change Centre Austria (data.CCCA)
- forest stand: field recordings of the Forest Administration Tyrol
- ForClim v.4.0.1: dynamic forest gap model developed by the Forest Ecology Group of ETH Zurich
- R Project: statistical computing

methodology

The study site is located at an elevation of 670 m asl with a steep, south-west facing slope. The average annual rainfall is app. 1080 mm with an annual mean temperature of app. 8.6° C. For the initial tree species structure, the current forest stand (I) was used. In further stand development scenarios species occasionally present in the regeneration and other thermophilus tree species are allowed for regeneration (II) or are planted (III). Tree species composition is predicted in annual time steps from 2020-2100.



Modelling workflow with different climate (A-C) and forest stand (I-III) scenarios visualised as business process model. A: current climate between 1981-2010, B: RCP 4.5 as moderate climate change scenario, C: RCP 8.5 as severe climate change scenario; I: present species regeneration only, II: mixed species regeneration, III: mixed species regeneration and planting




Change in growing stock for different species and climate scenarios in relation to the prediction with present species regeneration only (I) under current climate scenario. solid line: mean of 100-fold model runs; shaded area: standard deviation of 100-fold model runs


results

- investigated forest stand indicate a significant climate-sensitivity
- current species composition only partially adapted to climate change
- current natural vegetation types, in this case a beech dominated forest, is not always appropriate as a silvicultural objective for future climate scenarios
- natural regeneration of mixed tree species should be fostered
- planting of thermophilus species can diminish negative effects of climate change


tree species recommendation



- Norway Spruce (*Picea abies*)
- European Larch (*Larix decidua*)



- European Beech (*Fagus sylvatica*)
- silver Fir (*Abies alba*)



- sessile Oak (*Quercus petraea*)
- small-leaved Lime (*Tilia cordata*)
- Scots Pine (*Pinus sylvestris*)