Modelling the potential of Douglas-fir in future European forests using LPJ-GUESS

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Overview

1. Introduction

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3. Model fit

4. Results and comparison to Norway spruce

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1. Introduction

Why Douglas-fir?

- High potential in the future
  - → Especially in low elevations (LAVENDER and HERMANN 2014)
  - → Excellent growth (e.g. EILMANN and RIGLING 2012)
  - → High drought and fire resistance (e.g. LÉVESQUE et al. 2014)

Why Norway spruce?

- Most popular high-yielding tree species in Europe (SPIECKER et al. 2019)
- 2nd most popular tree species in Europe overall (KÖBLE et al. 2002)
- Many studies predict that Douglas fir will outperform Norway spruce in yields (e.g. PODRÁZSKY 2015)

1. Introduction

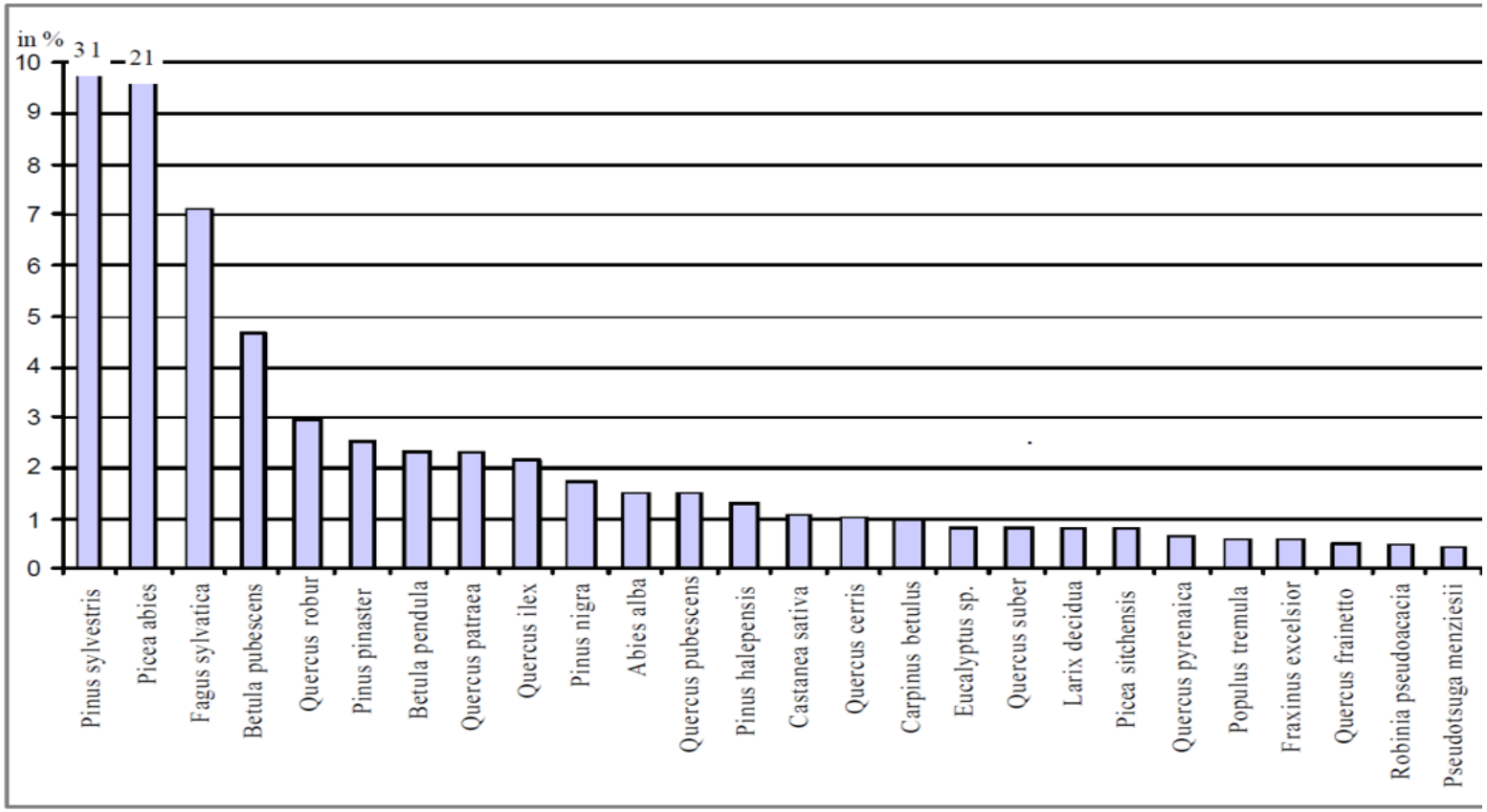
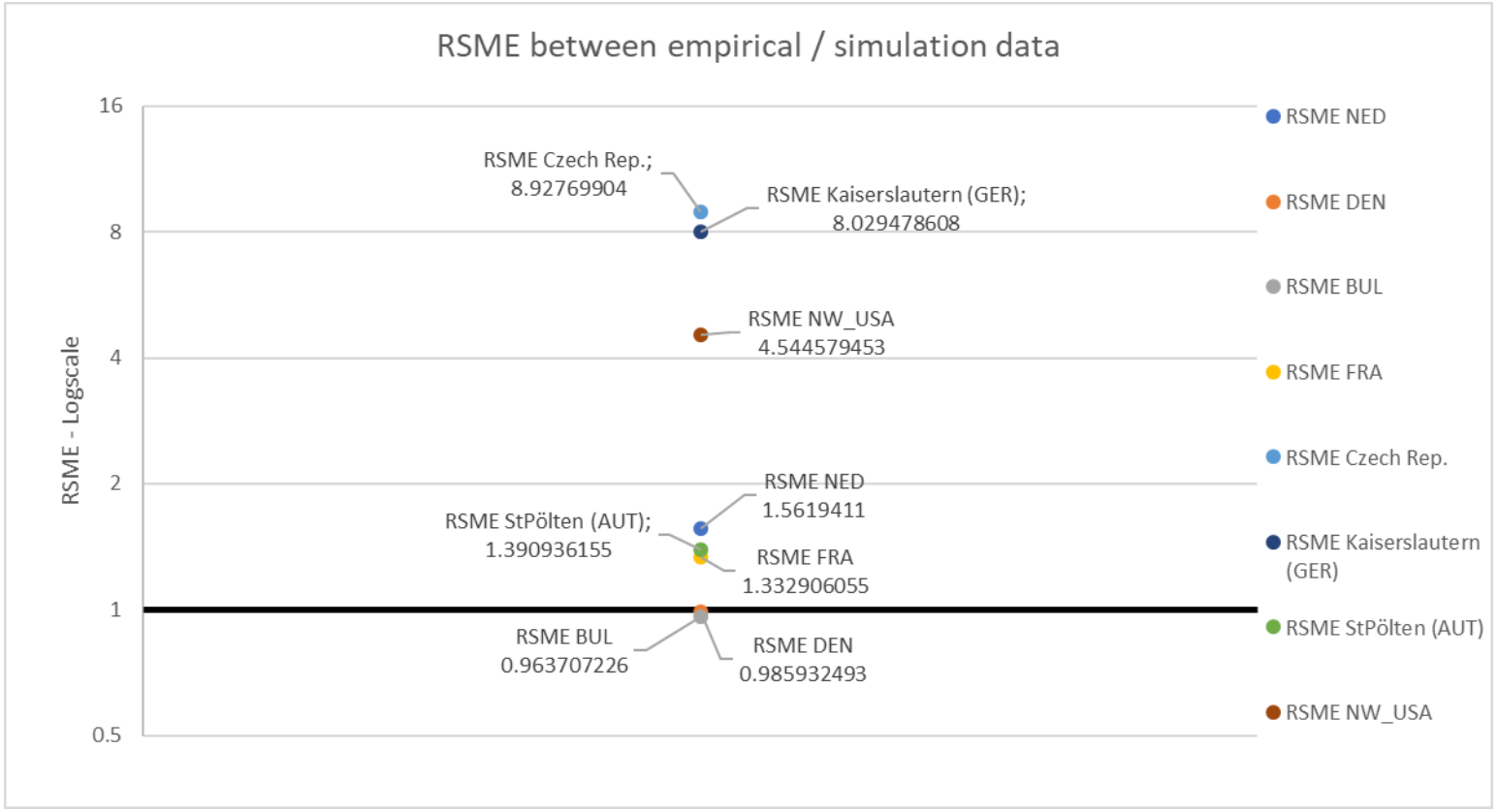


Fig. 1: Tree species distribution in the EU30 forest area (KÖBLE et al. 2002). Scots Pine (31%), Norway Spruce (21%), Douglas fir (0.04%)

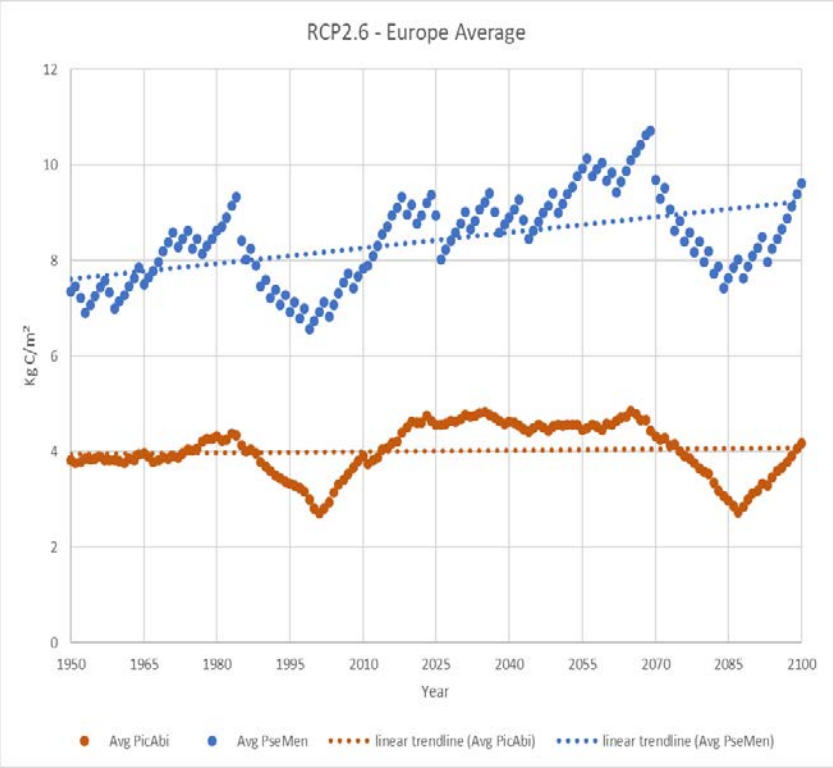
2. Methods

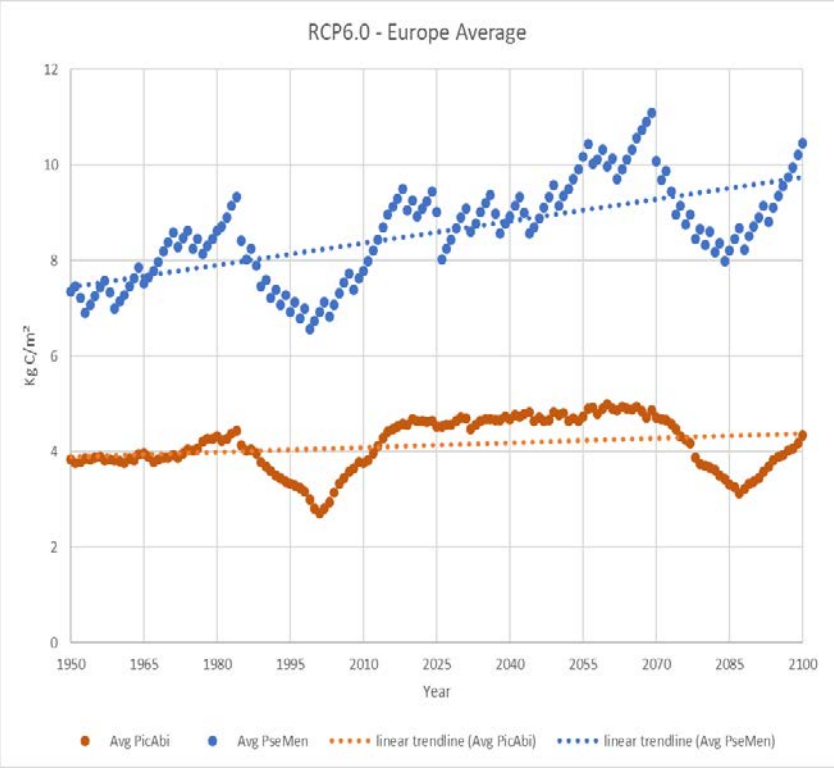
- Pseudotsuga menziesii (Mirb.) Franco var. viridis – Coastal Douglas fir
- Resolution: 0.5° x 0.5°
- Monocultures; mixed-age stands
- Parameters of Douglas fir based on literature values and calibration
- Parameters of Norway spruce by Herschlein et al. in prep.

3. Model fit


RSME between empirical / simulation data
RSME - Logscale
16
8
4
2
1
0.5
RSME Czech Rep.; 8.92769904
RSME Kaiserslautern (GER); 8.029478608
RSME NW_USA 4.544579453
RSME NED 1.5619411
RSME StPölten (AUT); 1.390936155
RSME FRA 1.332906055
RSME BUL 0.963707226
RSME DEN 0.985932493
RSME NED
RSME DEN
RSME BUL
RSME FRA
RSME Czech Rep.
RSME Kaiserslautern (GER)
RSME StPölten (AUT)
RSME NW_USA

4. Results and comparison to Norway spruce





- Slope of linear trendline (Avg PseMen):

m = 0.011x

- Slope of linear trendline (Avg PicAbi):

m = 0.0009x

- Slope of linear trendline (Avg PseMen):

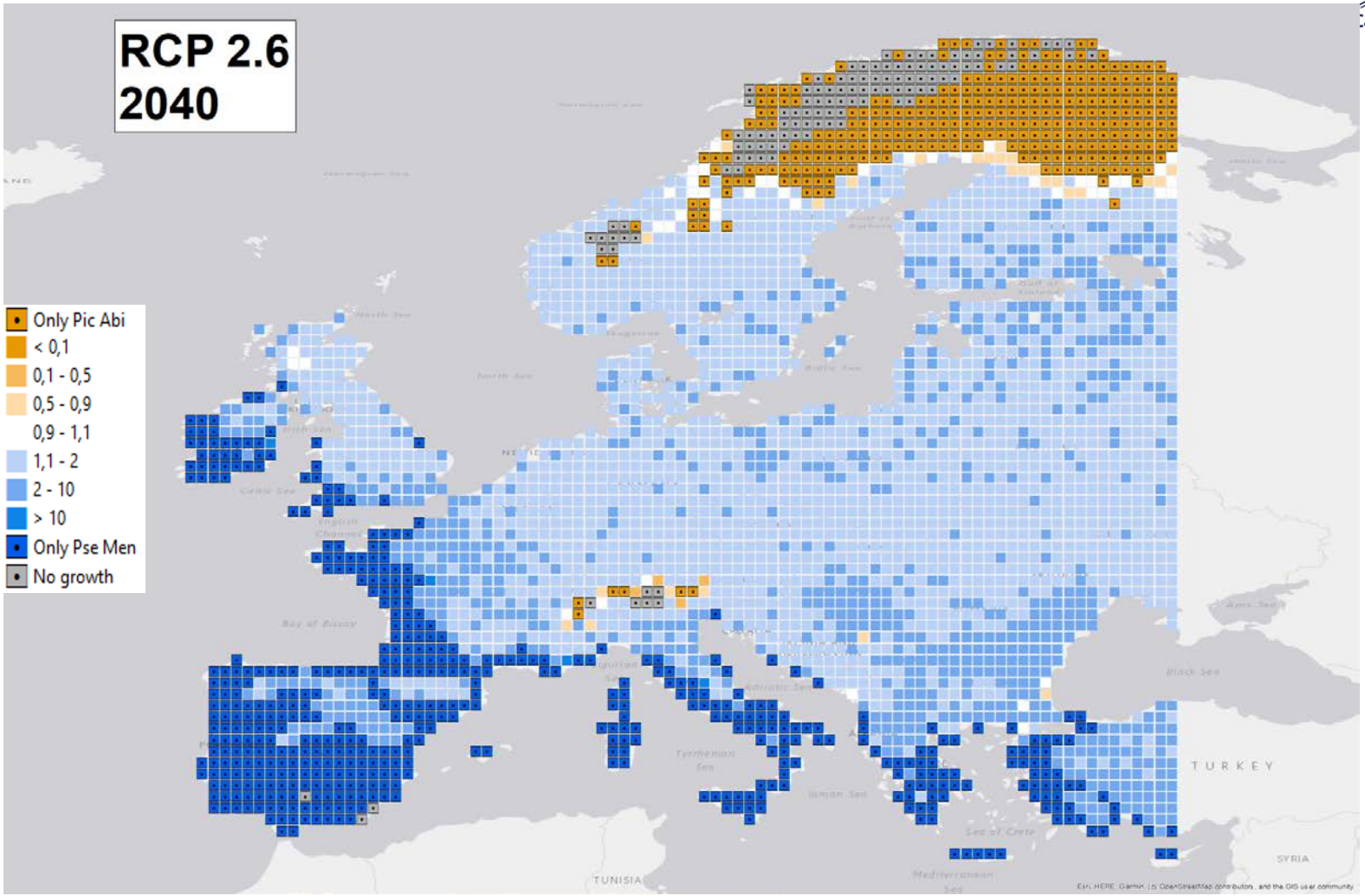
m = 0.0154x

- Slope of linear trendline (Avg PicAbi):

m = 0.0033x

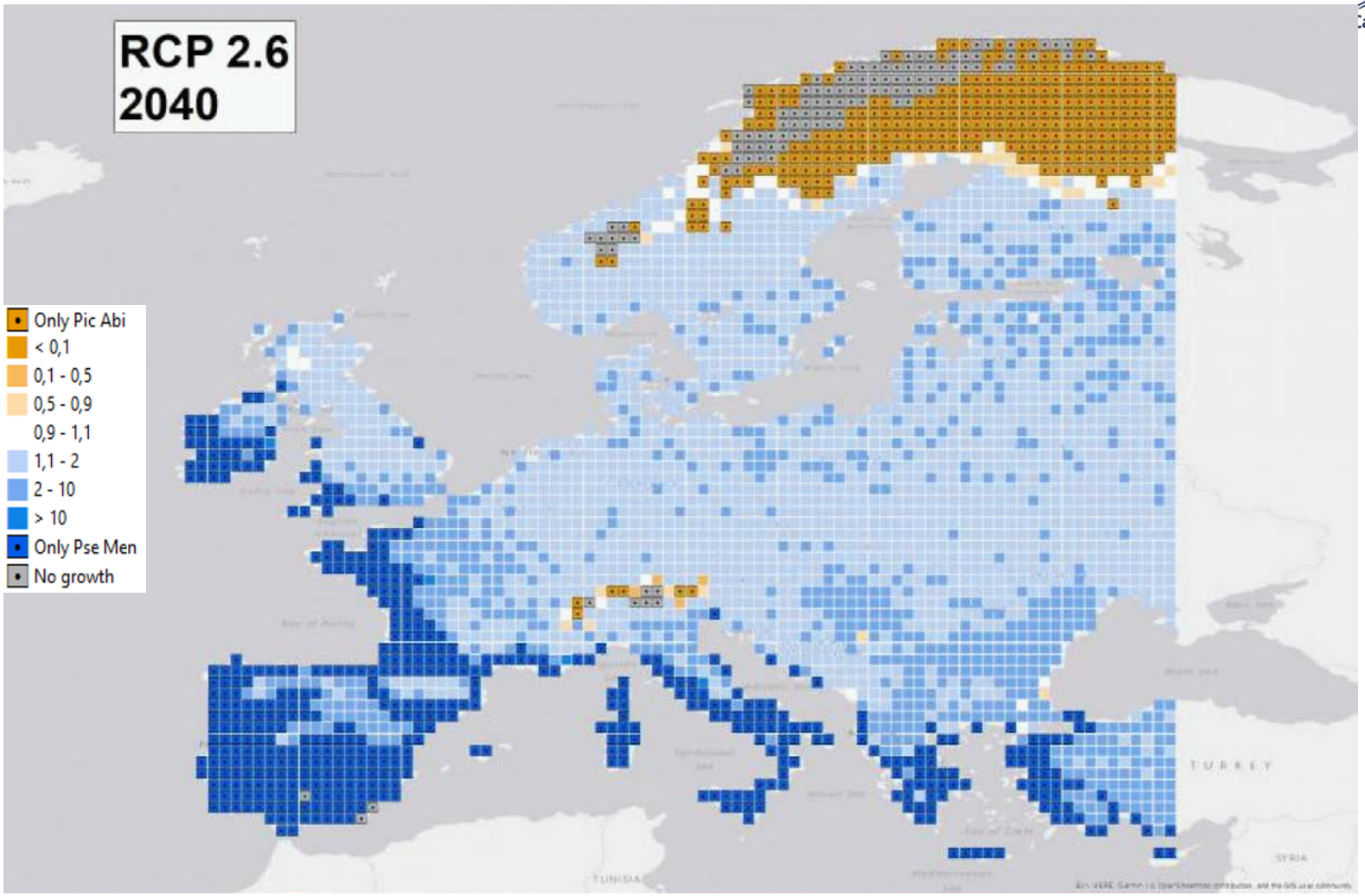
4. Results and comparison to Norway spruce

PseMen and PicAbi distribution in Europe – RCP 2.6



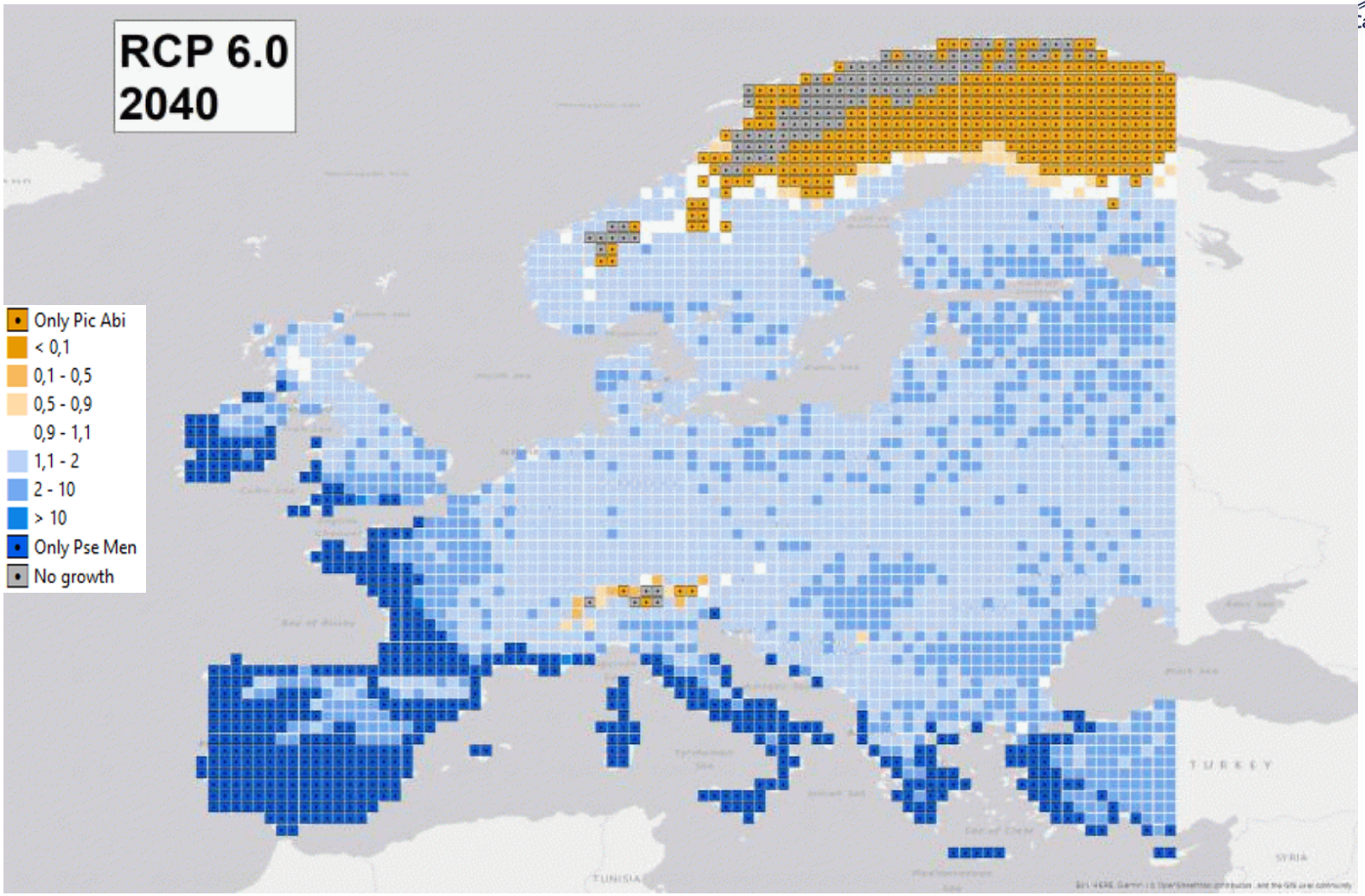
4. Results and comparison to Norway spruce

PseMen and PicAbi distribution in Europe – RCP 2.6



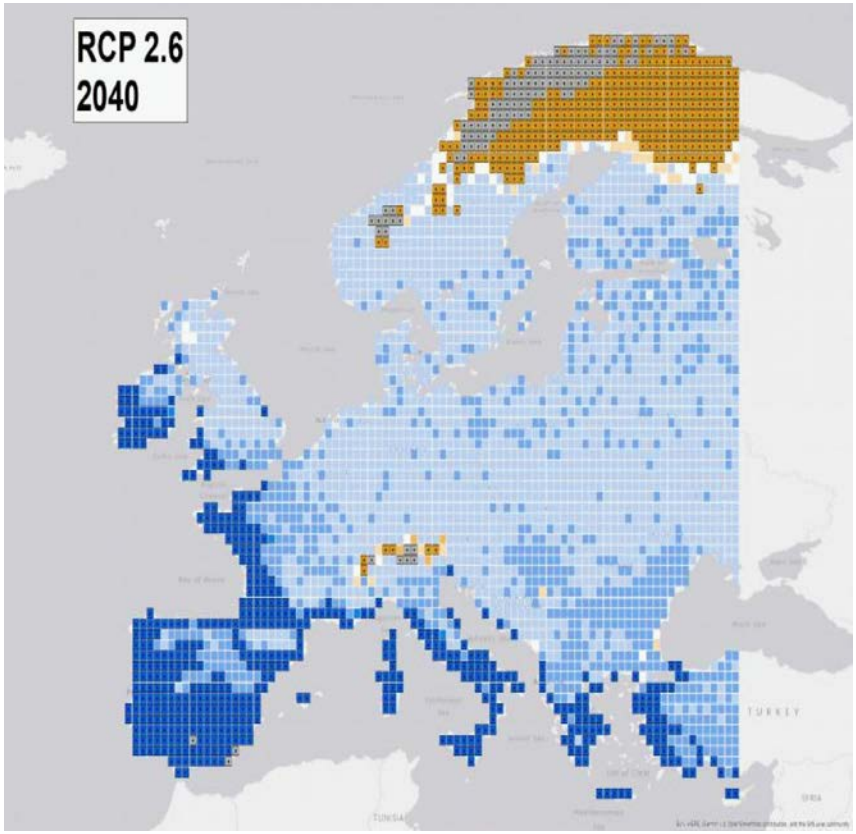
4. Results and comparison to Norway spruce

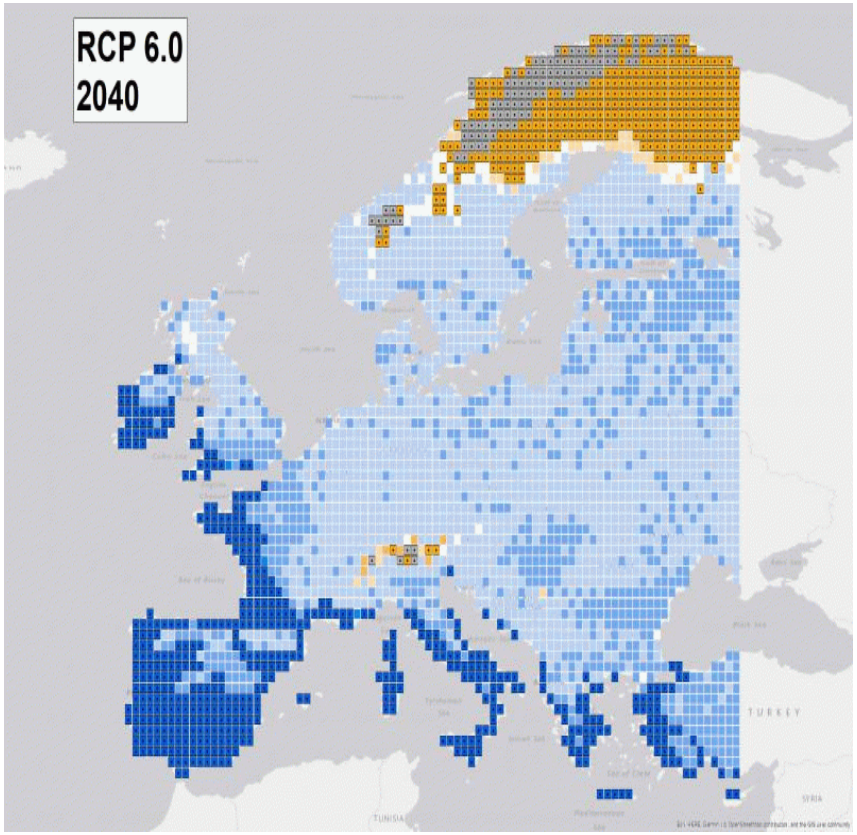
PseMen and PicAbi distribution in Europe – RCP 6.0



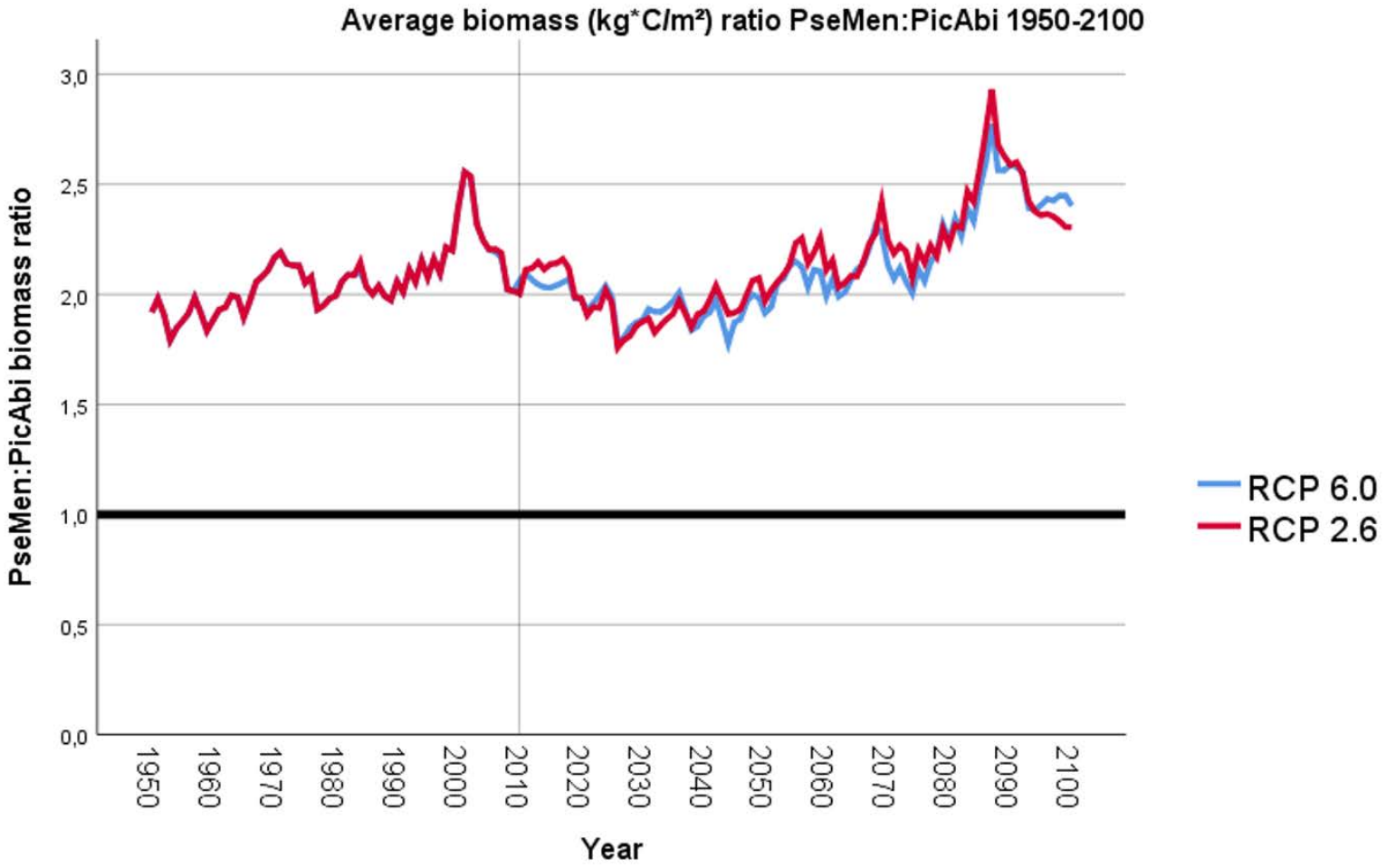
4. Results and comparison to Norway spruce

PseMen and PicAbi distribution in Europe – Comparison





4. Results and comparison to Norway spruce



5. Conclusion and discussion

- Regardless of the climate scenario and year, Douglas fir is consistently outperforming Norway spruce in biomass

- In both climate scenarios, Douglas fir is producing more biomass in the future

→ Results indicate that Douglas fir is a considerable, if not a better pick for future afforestation

5. Conclusion and discussion

- At this stage further calibration needs to be done
- For model simulations many environmental factors aren’t taken into account
- For picking the appropriate tree species there are many more factors to be considered than just biomass, like wood quality, value, impacts on the ecosystems, …