



# Evaluation of the INSEA forestry scenario model

I N T E G R A T E D   S I N K   E N H A N C E M E N T   A S S E S S M E N T



I N S E A  
P A R T N E R S

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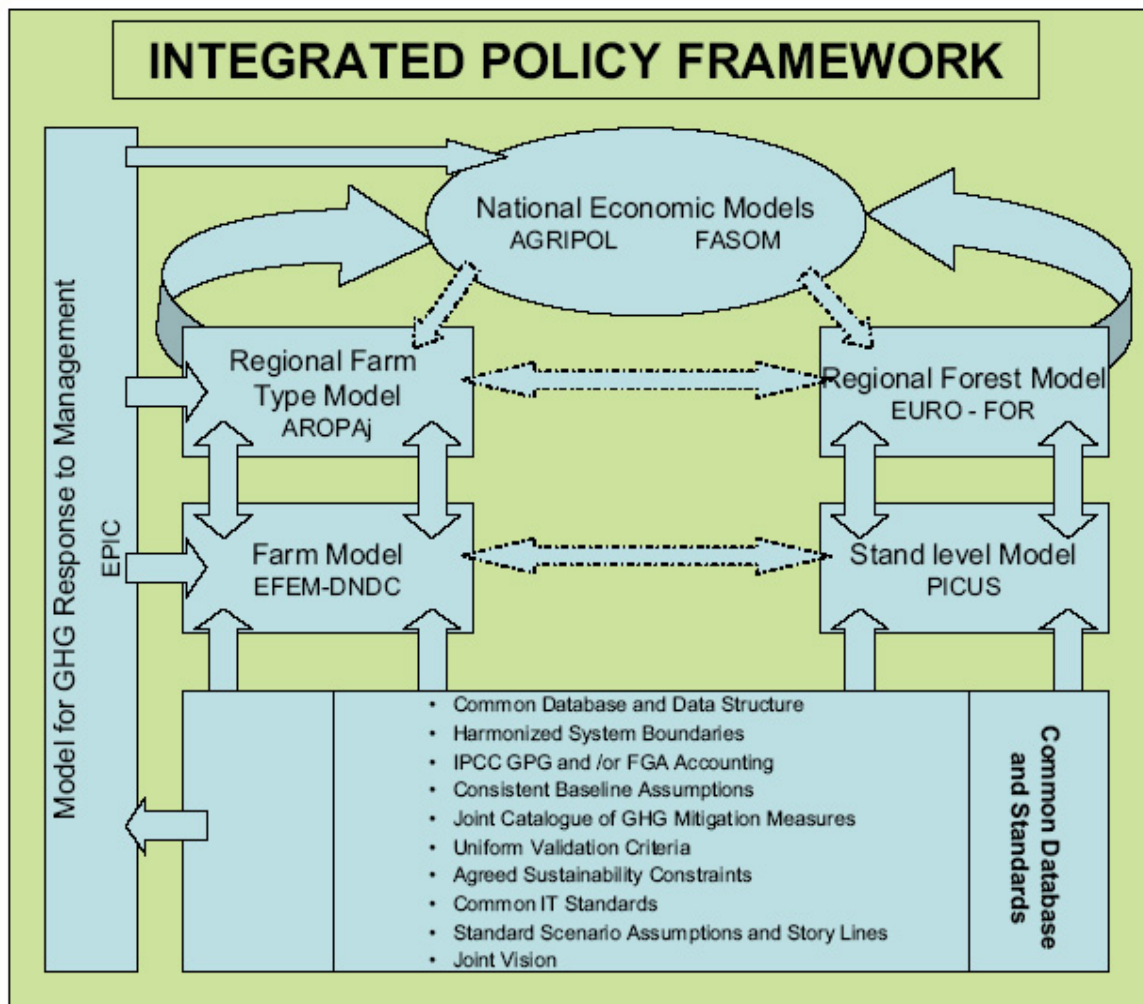
# content

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- evaluation: INSEA-study design revisited
- the plot level forest model PICUS
- the model comparison experiment
- evaluation results
  - productivity
  - management

# evaluation design

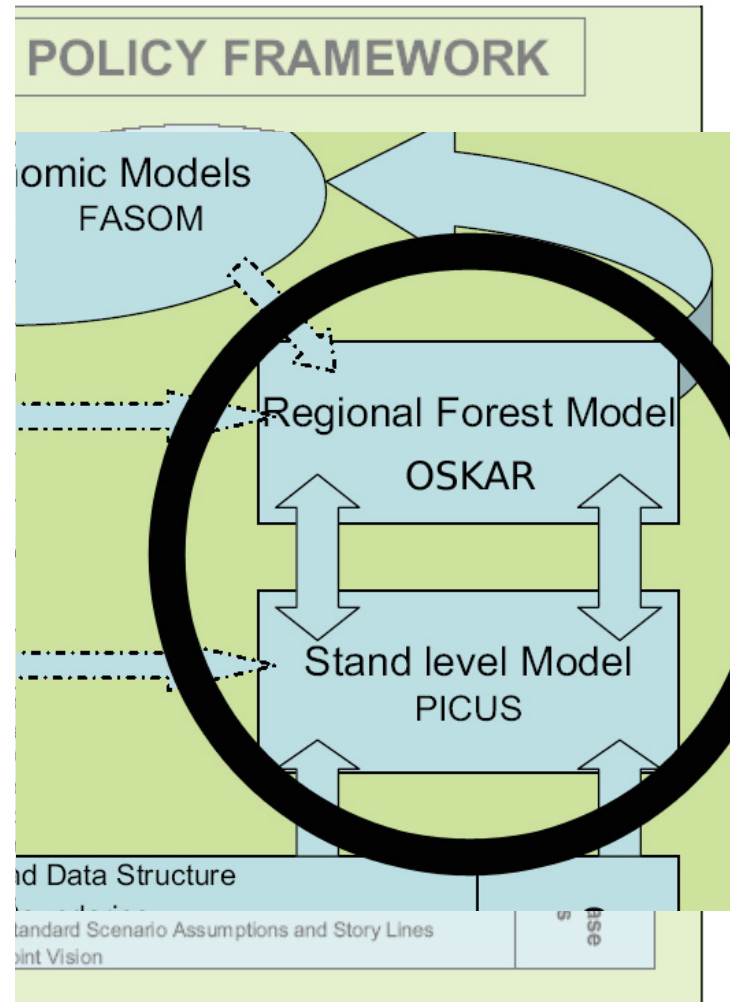
## INSEA structure revisited



# evaluation design

## INSEA structure revisited

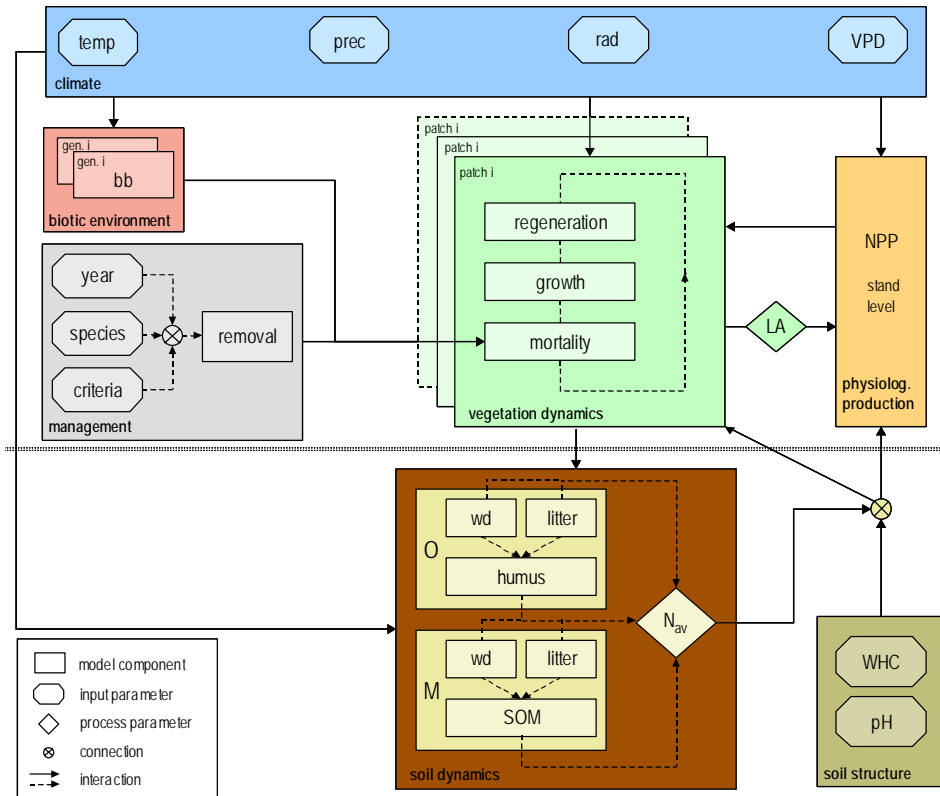
- ▣ nested simulations
- ▣ limited spatial scope
- ▣ increased level of detail



# PICUS v1.42

## model structure

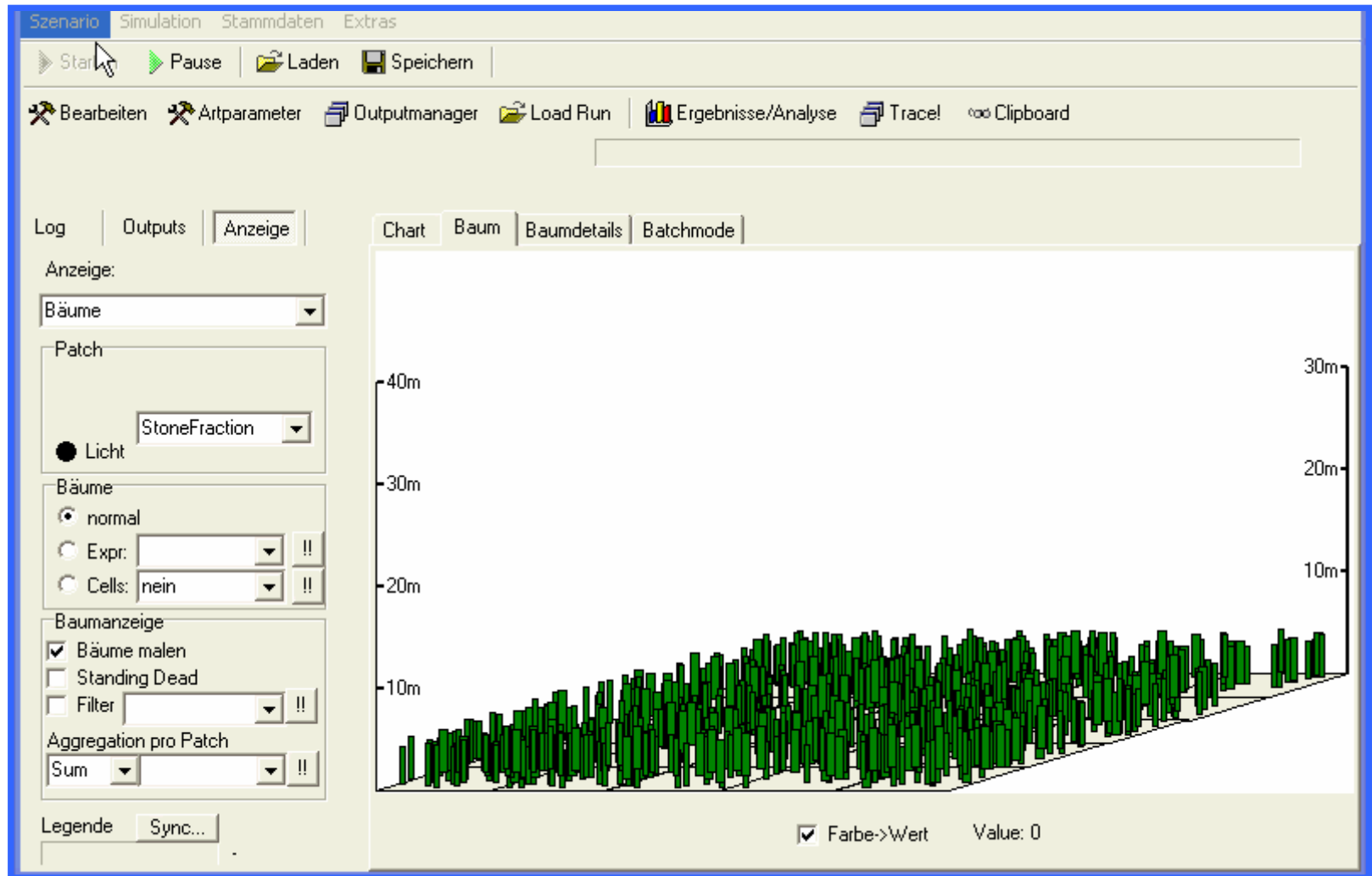
- hybrid forest patch model
- gap model & process-based
- 3D structure (indiv. trees)
- modular components
- flexible forest management
- evaluated, applications
- scope: Central Europe



more info: [www.wabo.boku.ac.at/picus.html](http://www.wabo.boku.ac.at/picus.html)

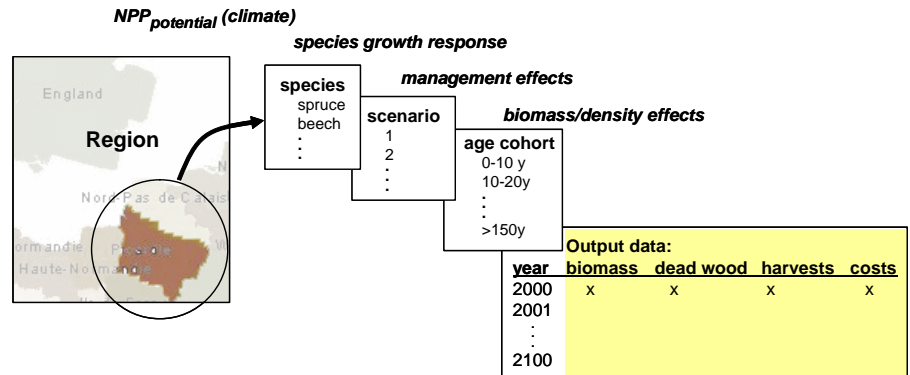
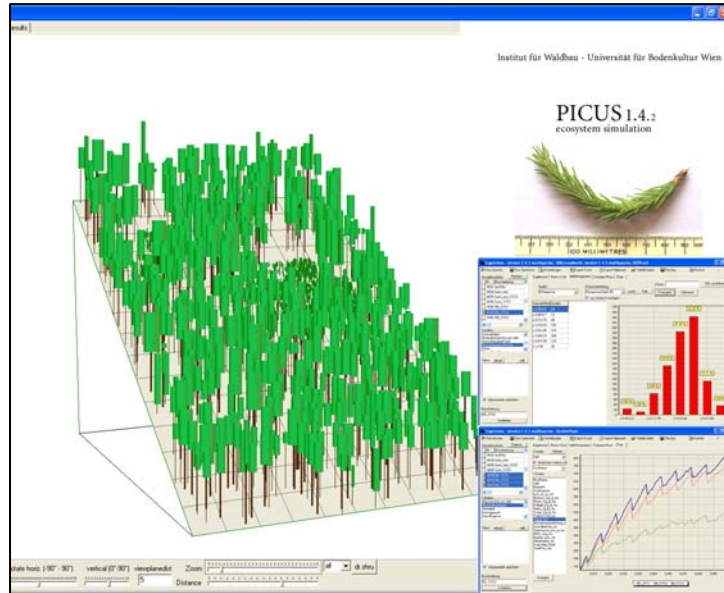
# PICUS v1.42

## model structure



# model comparison

## issues



### □ PICUS

- input data (climate, soil, stand)
- detailed mgmt prescription
- scale: forest stand
- generality: limited (central Europe)

### □ OSKAR

- (external) potential NPP
- general mgmt prescription
- scale: region (NUTS-2)
- generality: widely applicable

# evaluation design

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- spatial scale
  - plot level (Austrian Forest Inventory - AFI)
  - 40 plots distributed over all forest ecoregions
  - extended ecological gradients (e.g., altitude 200m-1.700m asl.)
  
- management
  - unmanaged: calibration of OSKAR NPP
  - MS1: thinning from below, high frequency (yield table)
  - MS2: thinning from above, less interventions (current practice)
  - simulation period: 100 yrs.
  
- stand
  - generic, 10yrs. old
  - monospecies
  - *Picea abies*, *Pinus sylvestris*, *Fagus sylvatica*, *Quercus robur*

**bottom line: plots analog to region x species for cont. scale simulations**

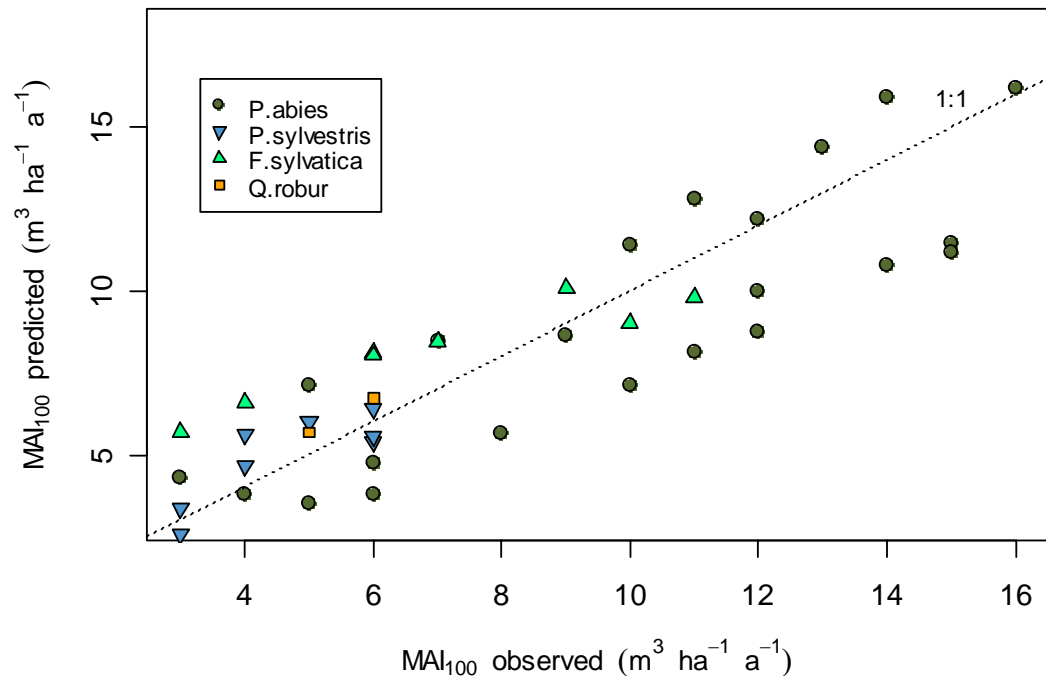


# plot level forest modelling

## results (1)

### □ PICUS v1.42

- 4 species
- n=40
- $R^2=0.76$

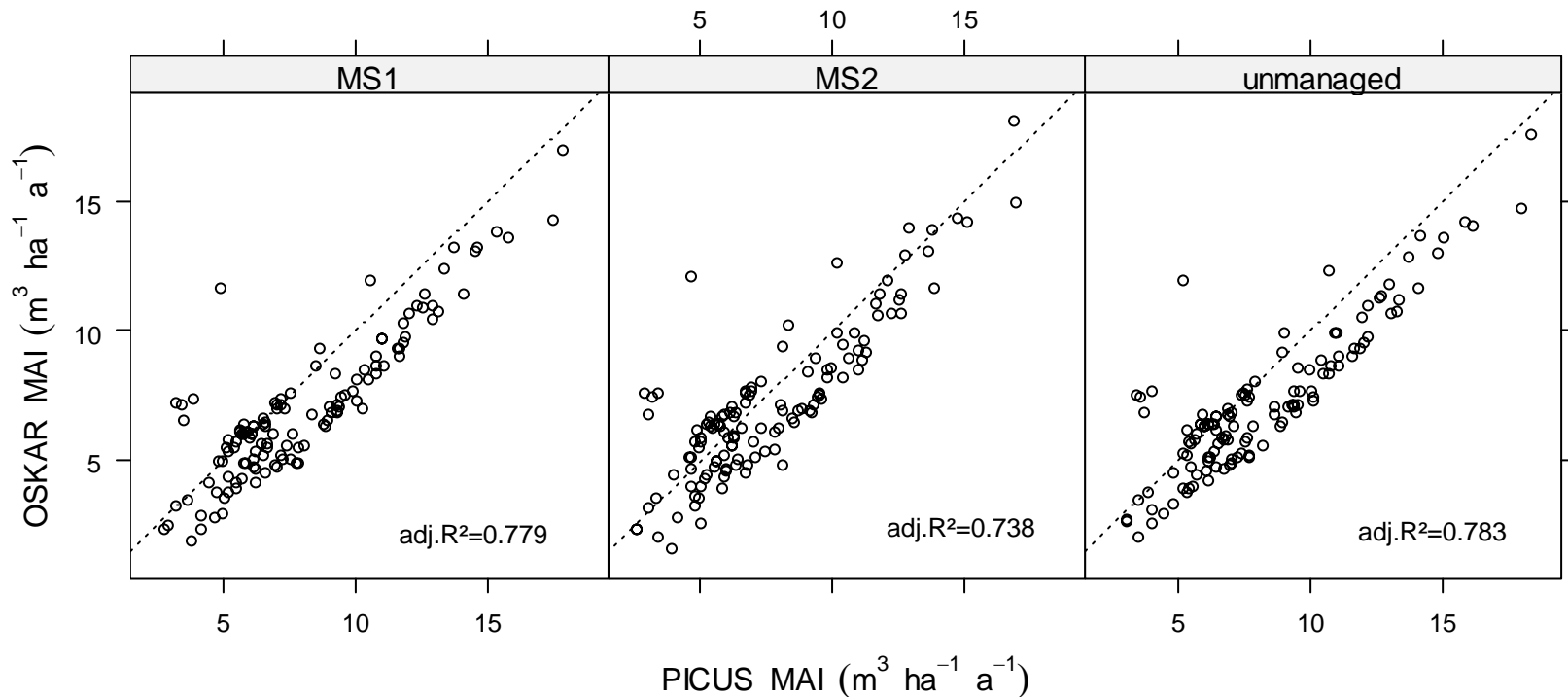


### □ statistical models (Norway spruce)

- Herzberger (1996):  $R^2=0.67$  (n=195)
- Schadauer (1999):  $R^2=0.66$  (n=289)

# productivity: management response

## results (2)

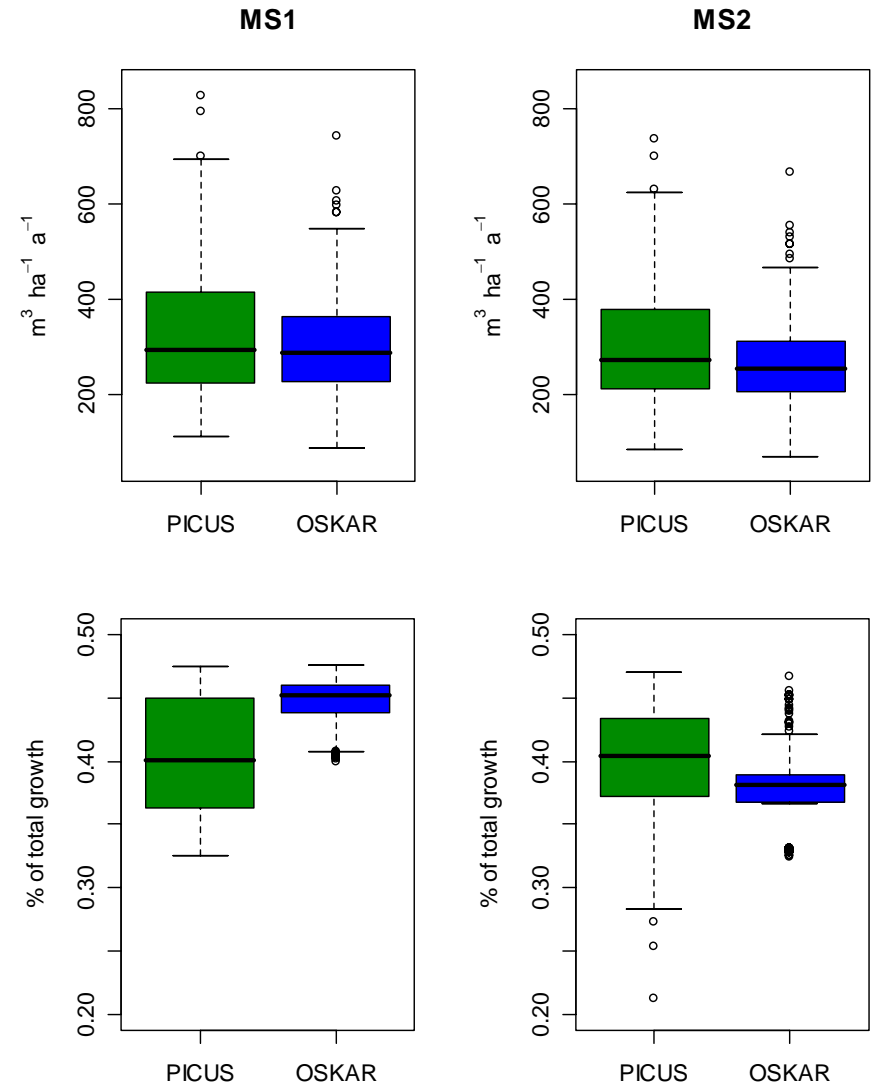


- already variation in the unmanaged (calibration) run
  - mortality, „potential“ NPP – assumptions, species
- total productivity consistent in both management regimes
- slight underestimation of OSKAR

# thinned volume

## results (3)

- absolute values
  - good agreement
  - OSKAR slightly lower -> productivity
- relative to total production
  - interval vs. intensity
  - MS1: higher frequency
  - MS2: higher intensity
- higher variation in PICUS

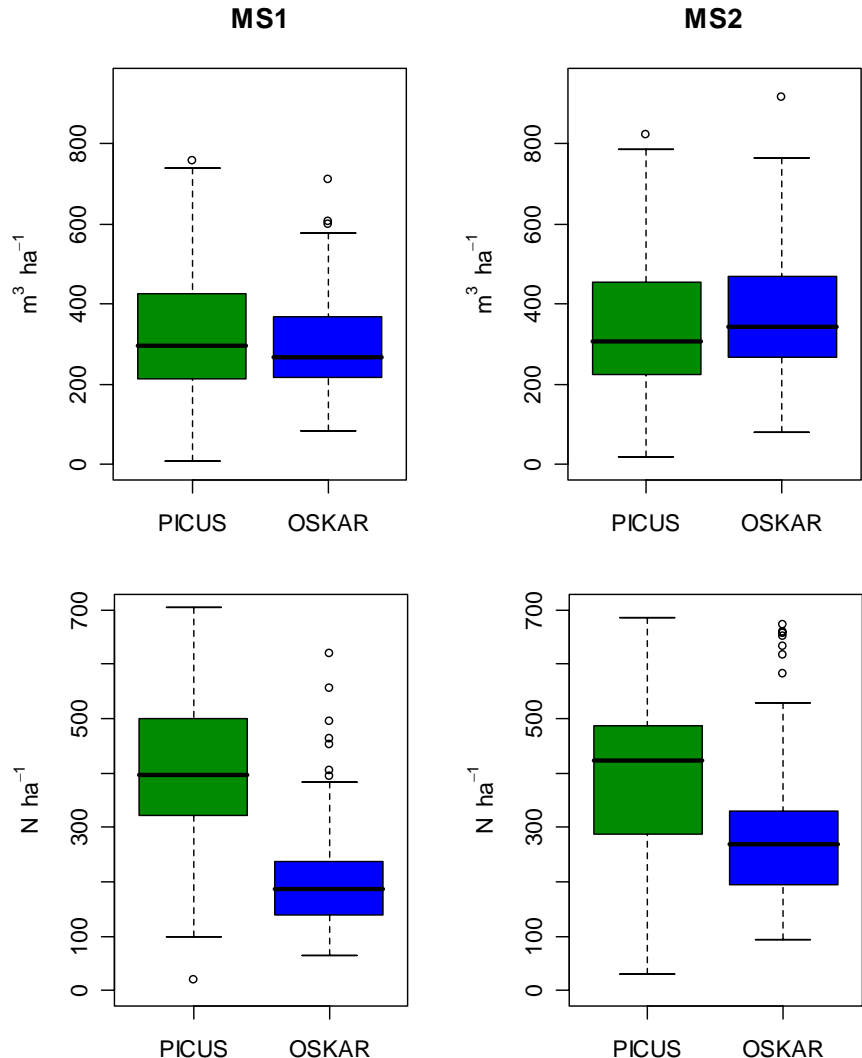


# state at rotation age (t=100)

## results (4)

- standing volume stock
  - good agreement

- stem number
  - less stems in OSKAR sims
  - MS1: high frequency



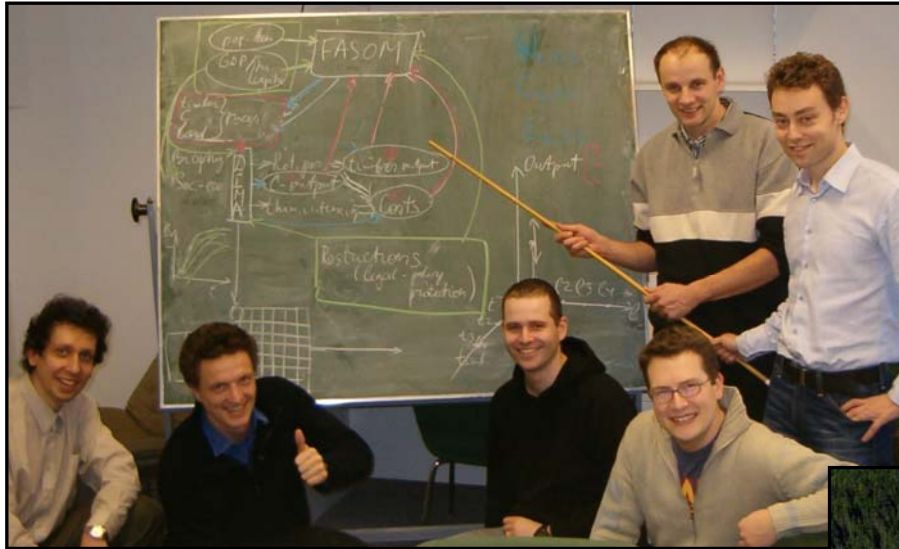
# discussion - conclusion

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- ❑ OSKAR model robust under varying ecological conditions
- ❑ overall very good agreement of models wrt production and management effects
- ❑ importance of (external) potential NPP
- ❑ ability wrt stand structure limited
- ❑ not covered in this evaluation (*yet worthwhile to investigate*)
  - effect of spatial variability/heterogeneity
  - soil carbon effects
  - climate change effects
  - fertilizer



# forest carbon,...



... efforts towards a better understanding...

...to facilitate its management.

