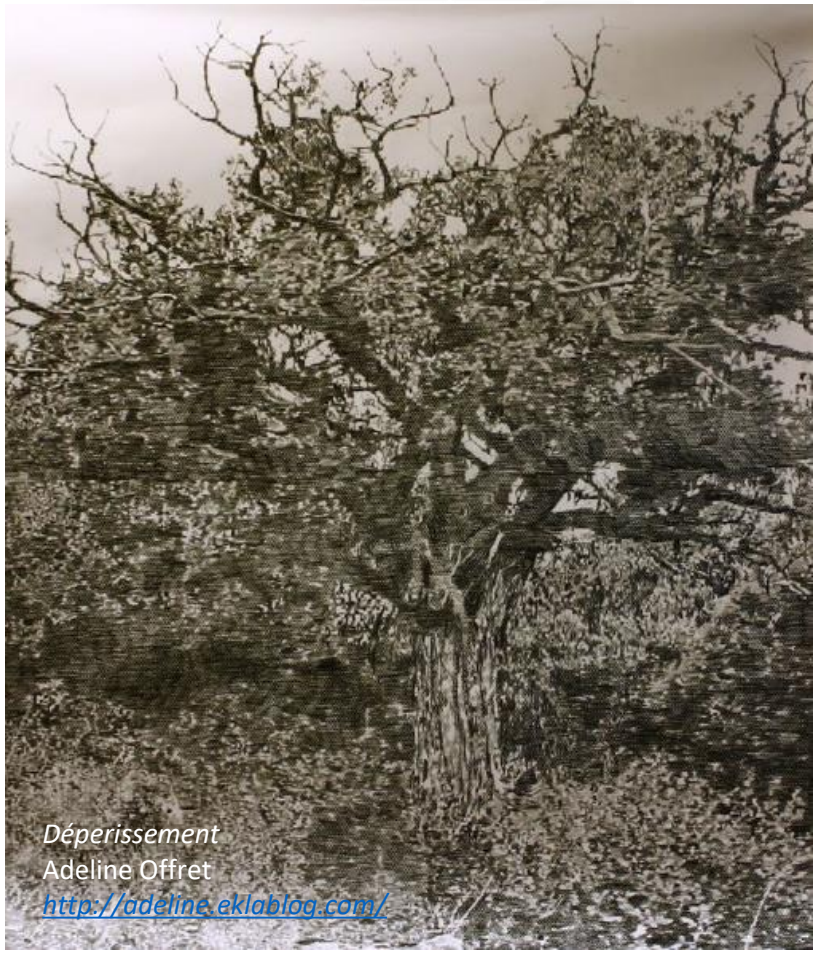

Déperissement
Adeline Offret
http://adeline.eklablog.com/

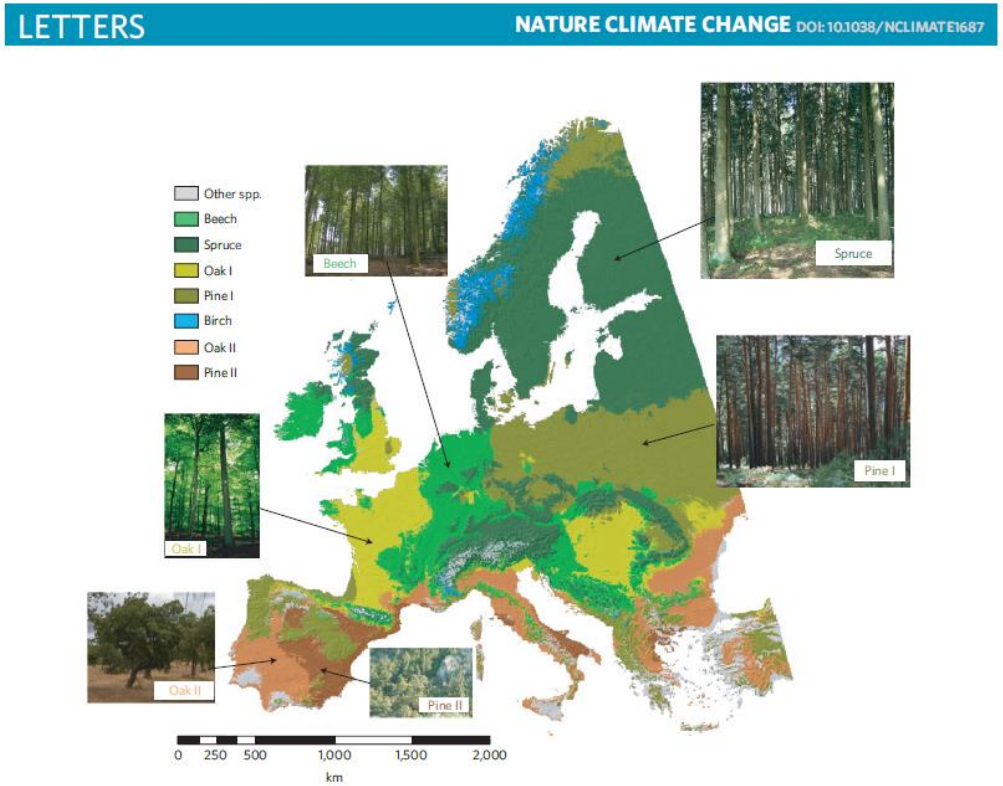
Climate uncertainties in forest impact modelling chains

Nicolas Martin URFM INRA

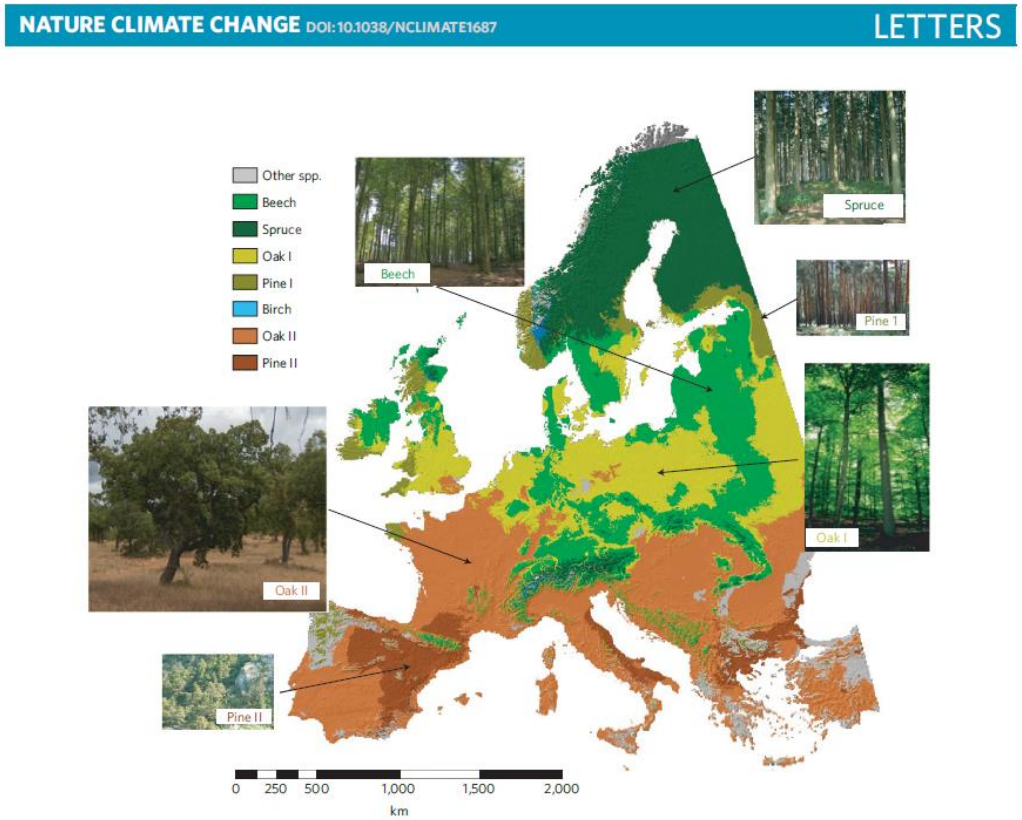
Leadley P, Stefanon M, Guillemot J, Ruffault J, François C, Drobinsky P, Somot S, Dufrene E

Forests under climate change

Current
1950-2000 climate



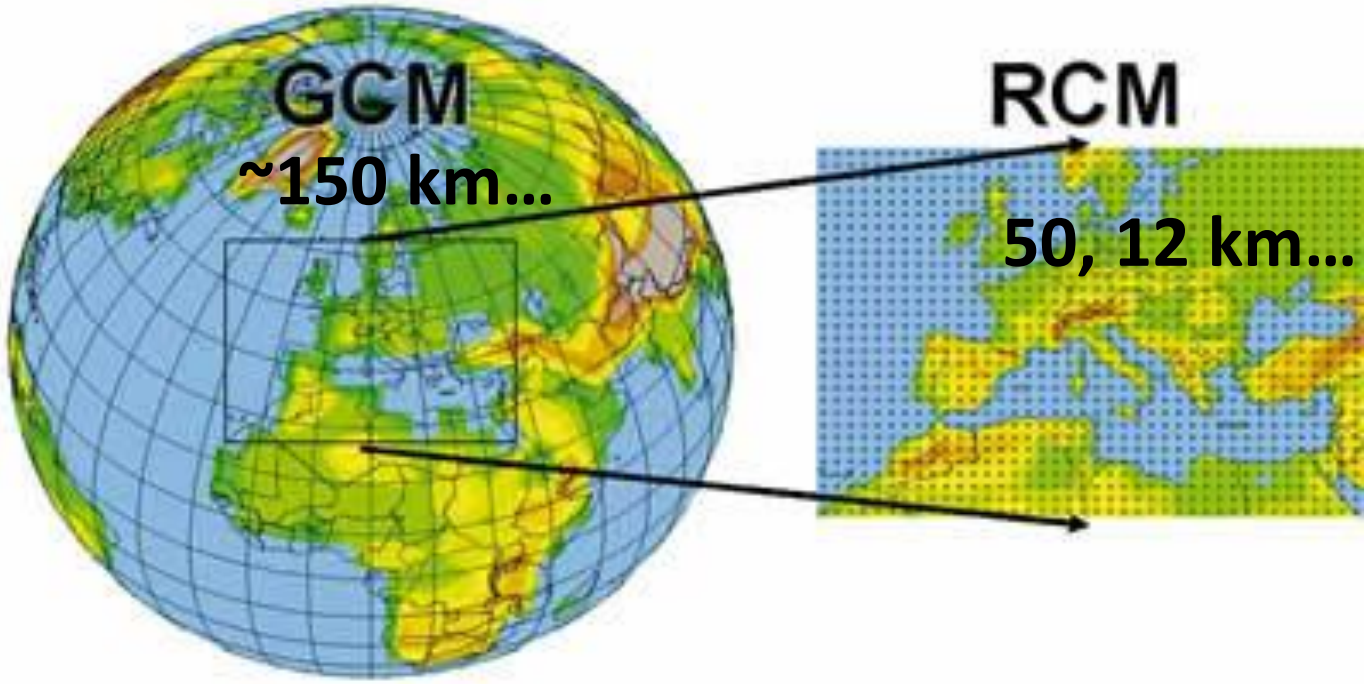
Future
2070-2100 climate



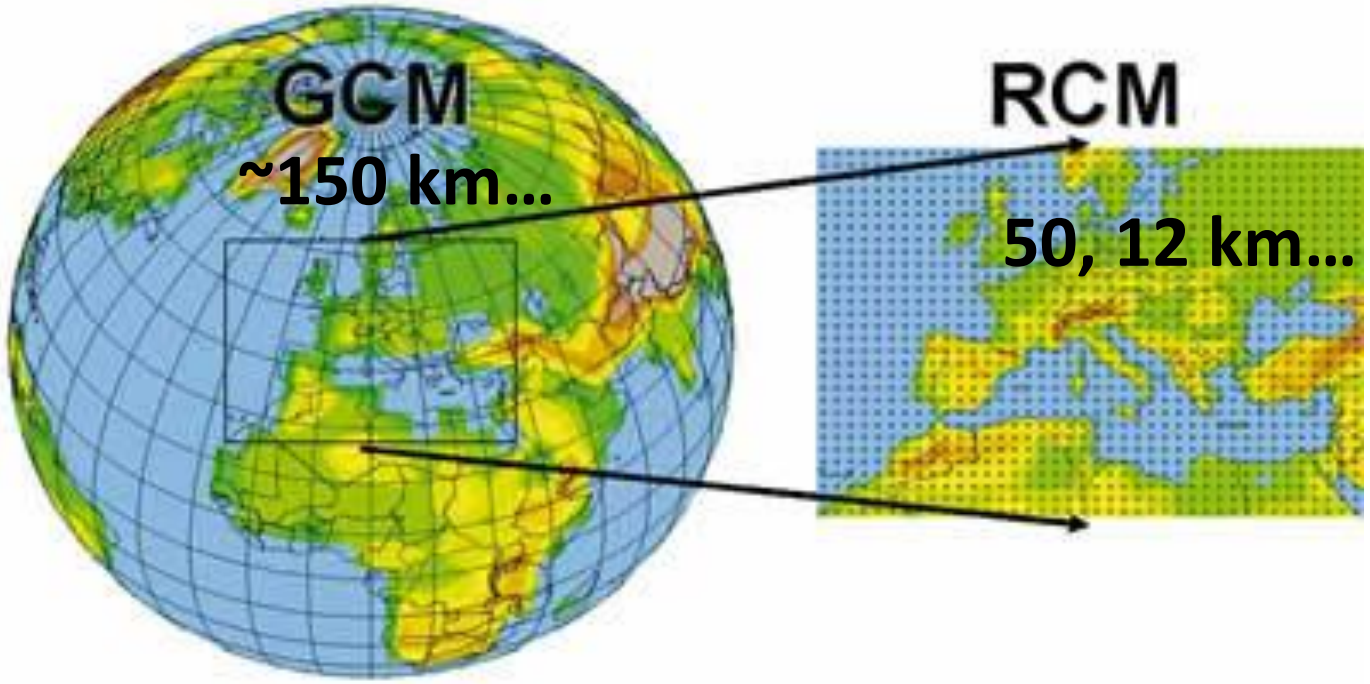
Finer resolution are required for adaptation strategies

Hannewinckel et al 2012 NCC

Typical modelling chain

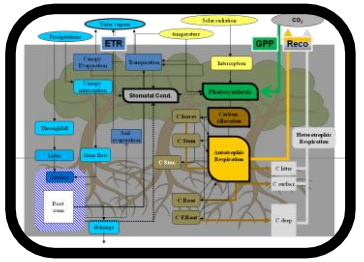


Typical modelling chain

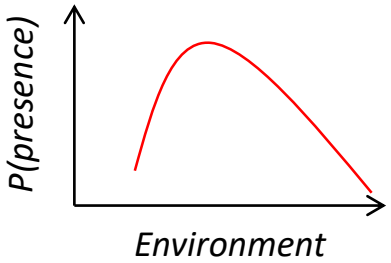


Biais correction

Impact models

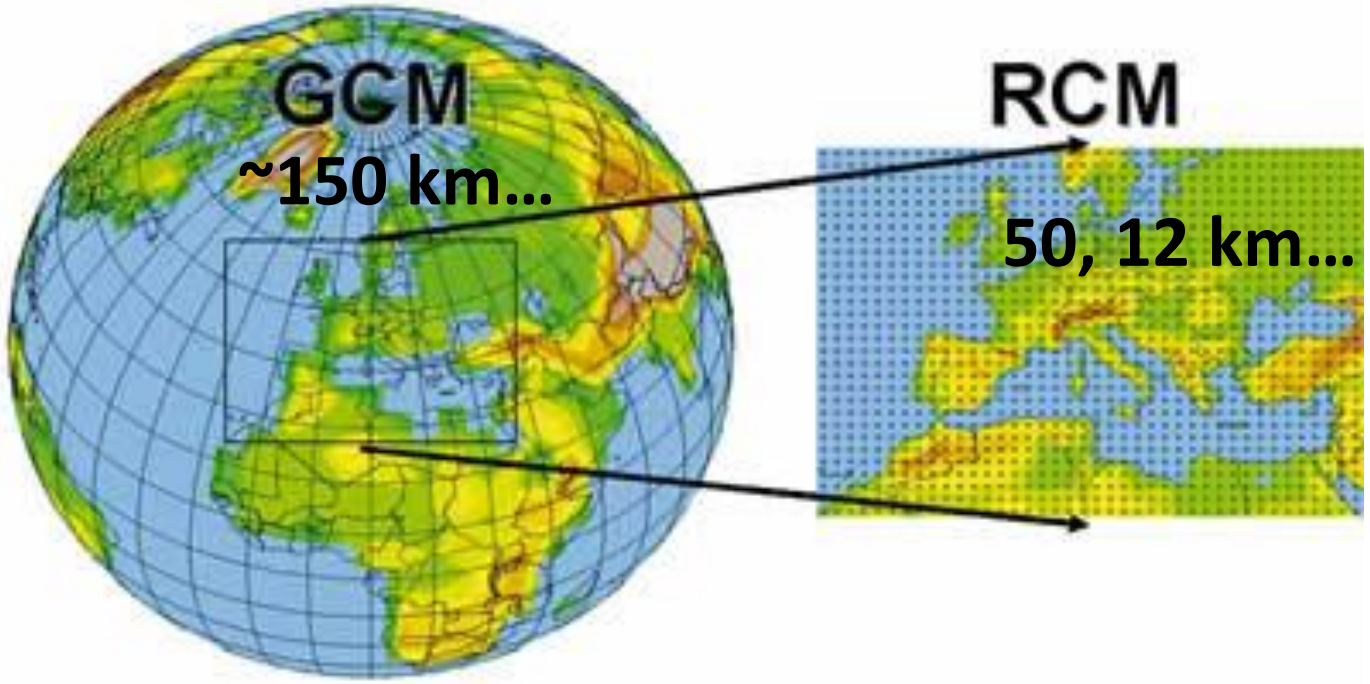


Process-based



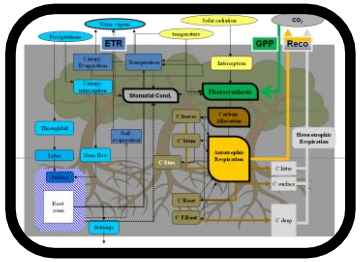
correlative

Typical modelling chain

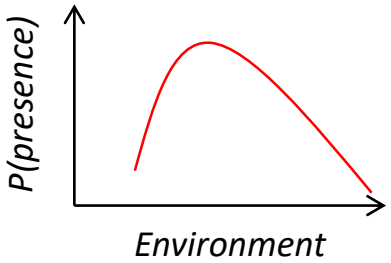


Biais correction

Impact models



Proces-based



correlative

What is the added value of climate regionalization in the frame of forest impact ? (without biais corrections!!)

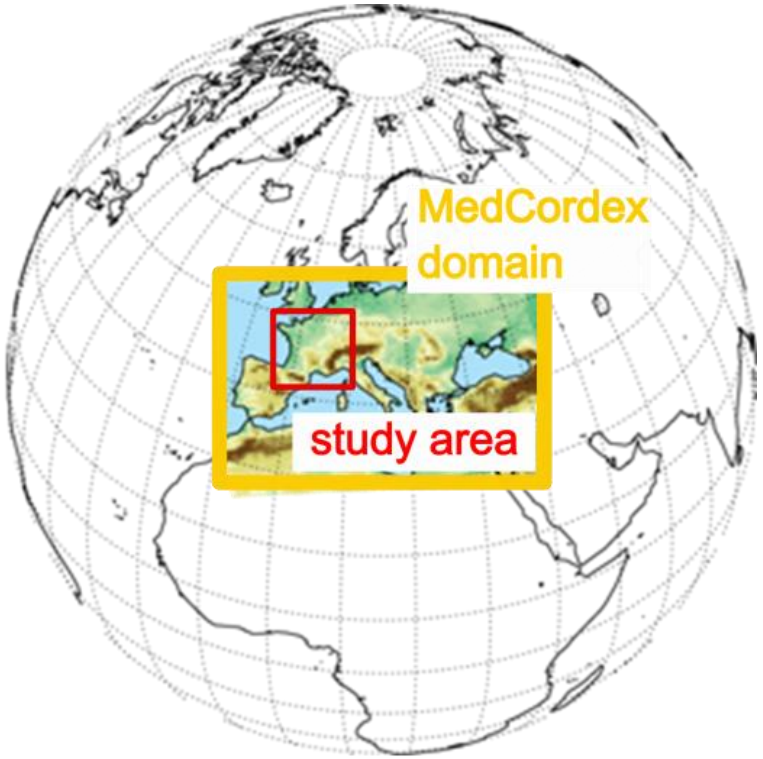
a. Are all RCMs equal to simulate impacts ?
b. Is there a benefit to increase the spatial resolution with RCM to simulate climate impacts on forests ?

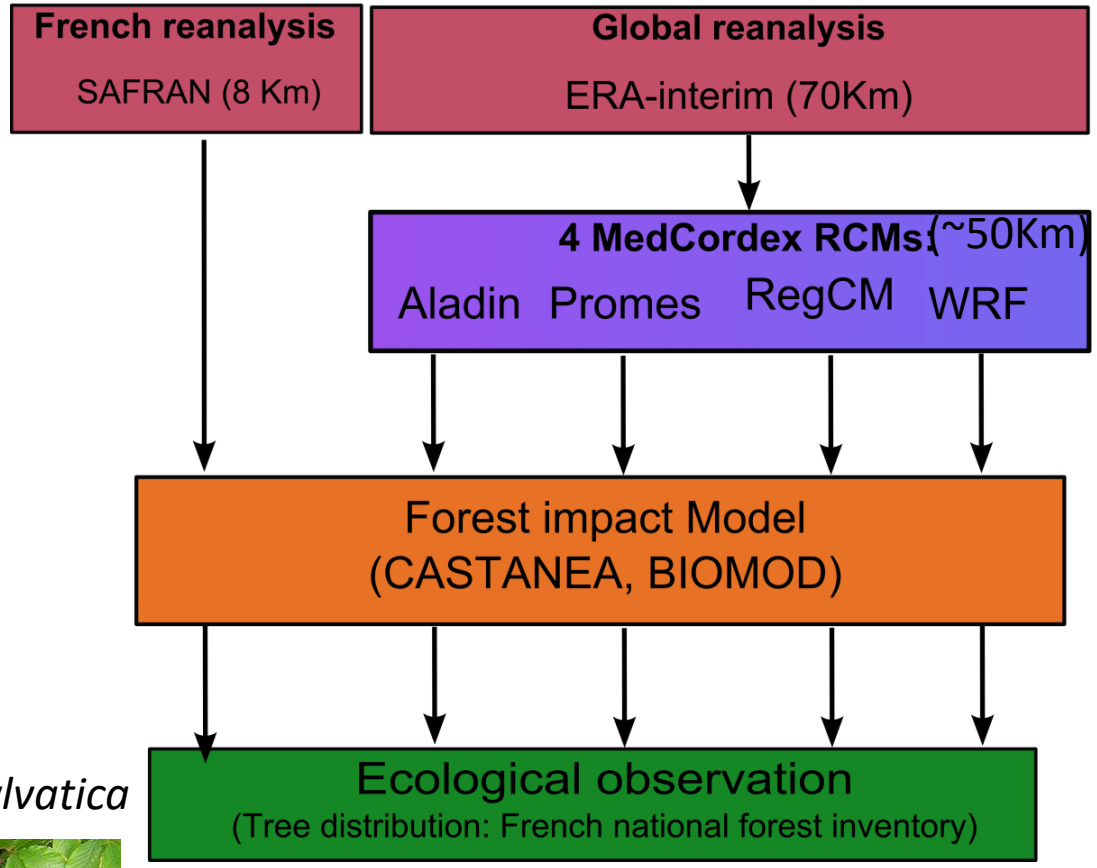
Question 1:

Are all RCM-Impact model couples equal to simulate forest impact ?

Are all RCM-Impact model chains equal to simulate forest impact ?

Method: Simulate tree distribution over France with different RCM-Impact model chain



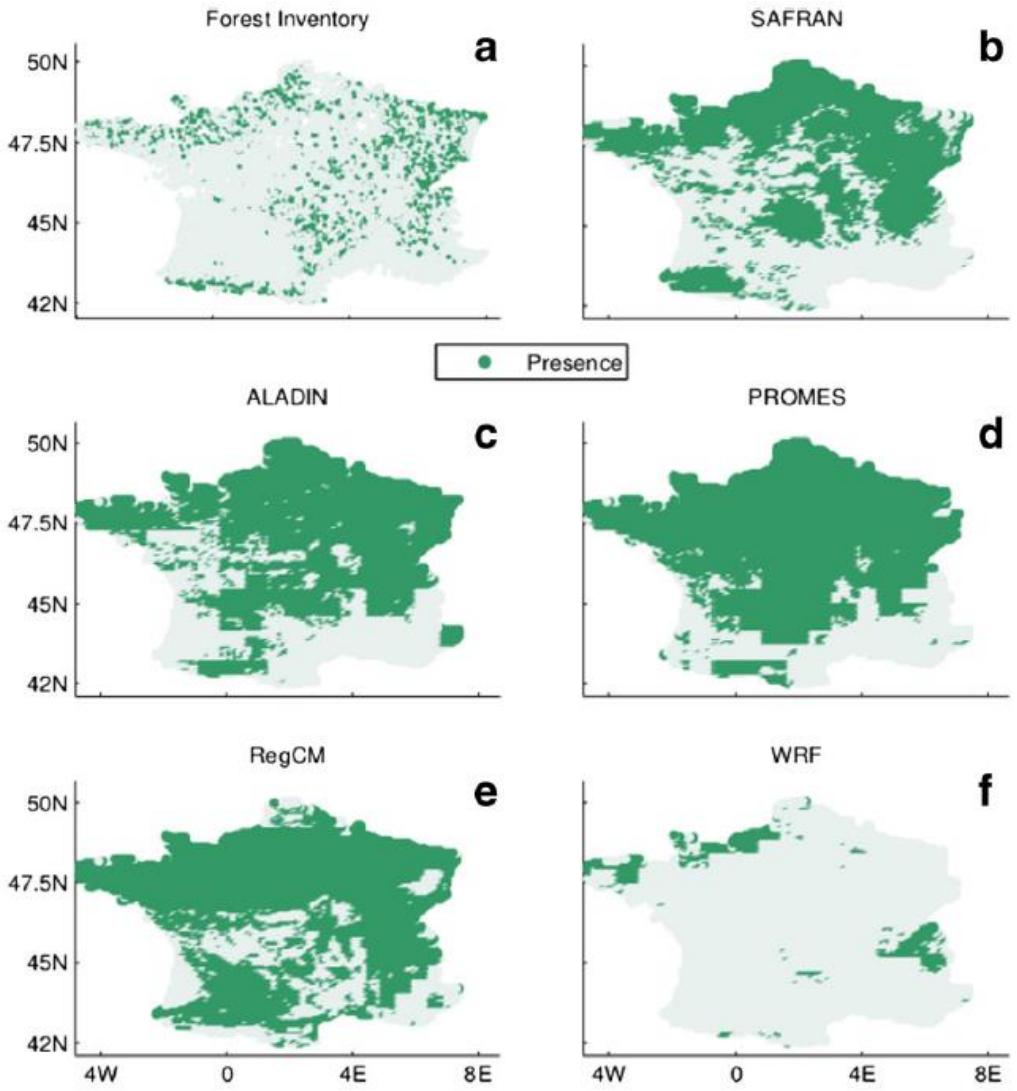


Fagus sylvatica

Stefanon et al 2015 *climatic change*

Are all RCM-Impact model chains equal to simulate forest impact ?

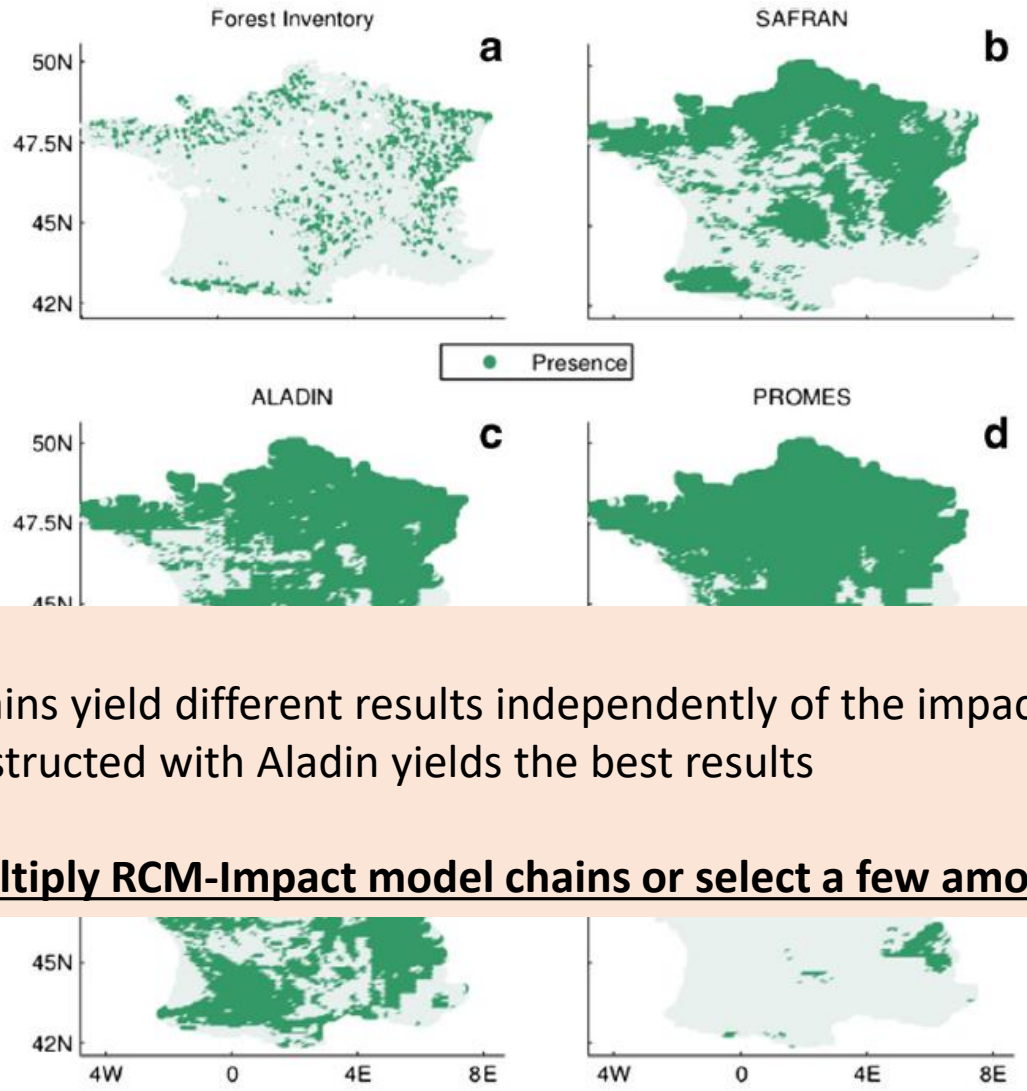
European Beech

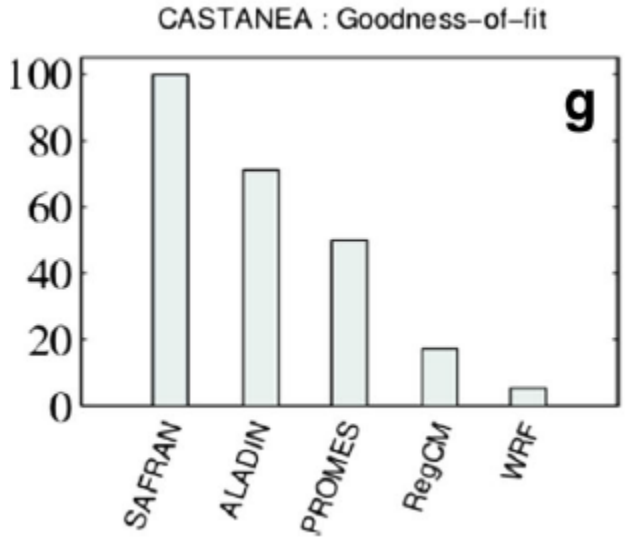


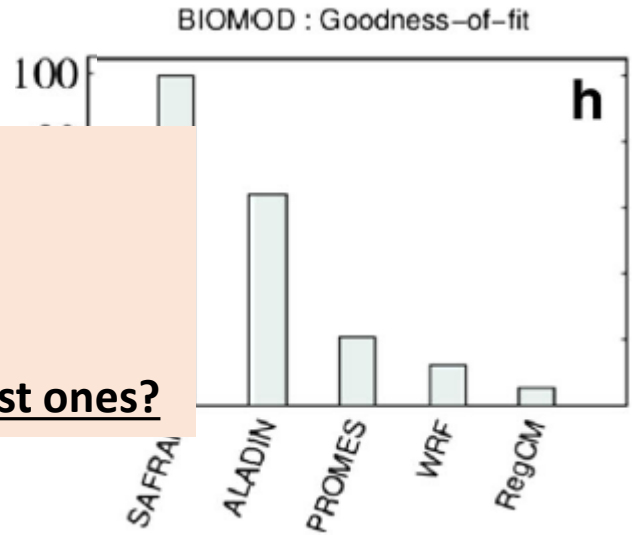
Stefanon et al 2015 *climatic change*

Are all RCM-Impact model chains equal to simulate forest impact ?

European Beech







Conclusion:

> Different chains yield different results independently of the impact model!

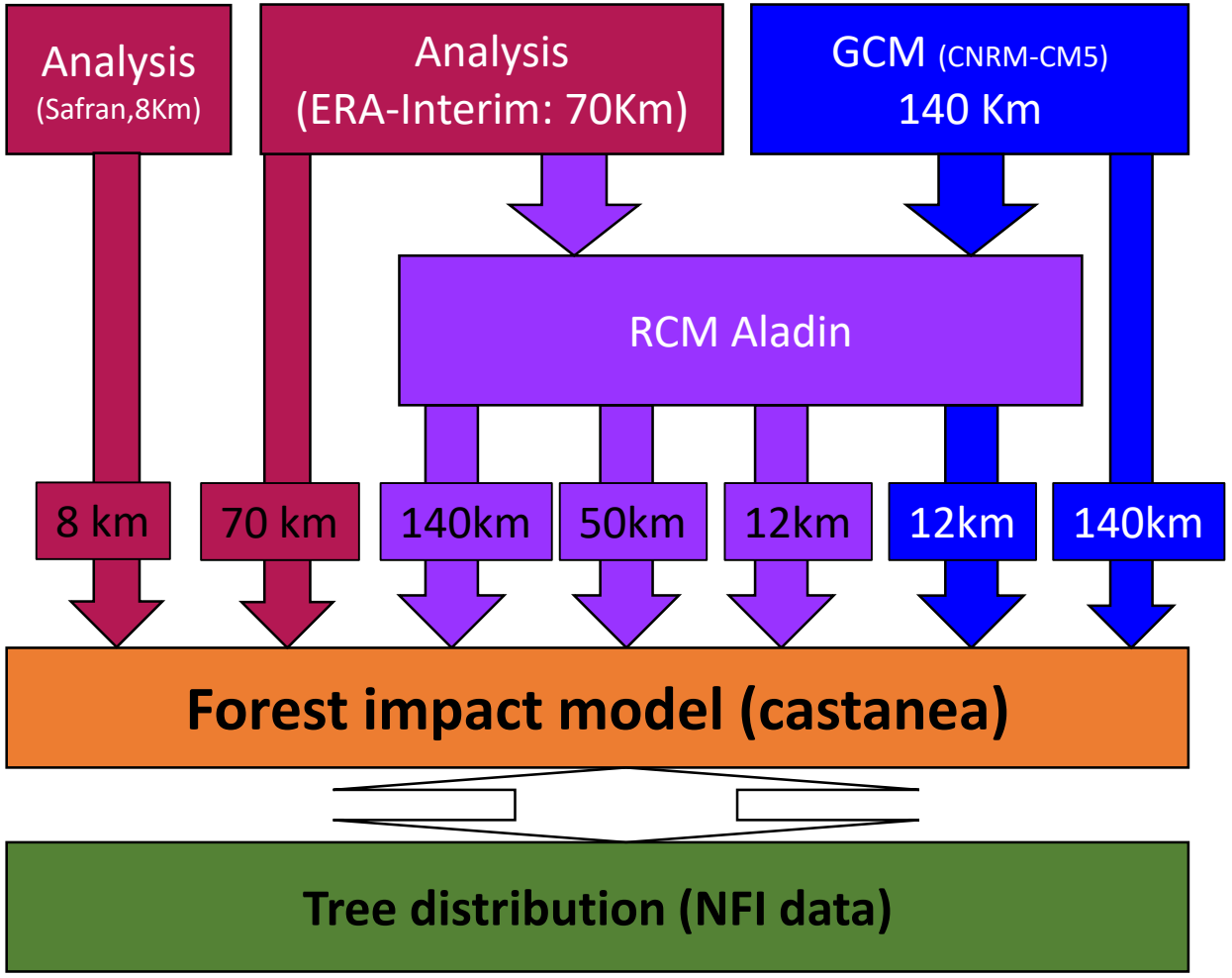
The chain constructed with Aladin yields the best results

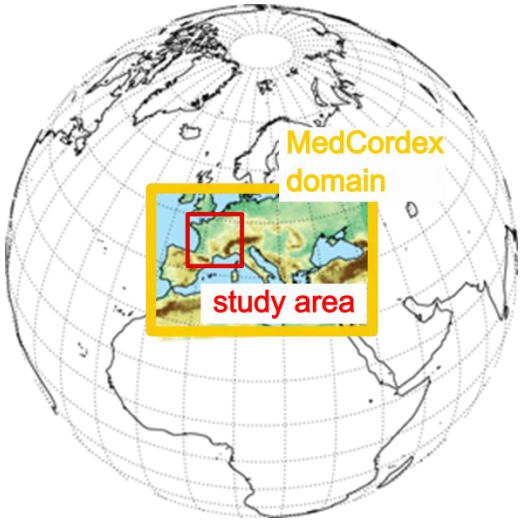
Should we multiply RCM-Impact model chains or select a few among the best ones?

Stefanon et al 2015 *climatic change*

QUESTION 2 : The higher spatial resolution of climate the better ?

Spatial resolution in the modelling chain



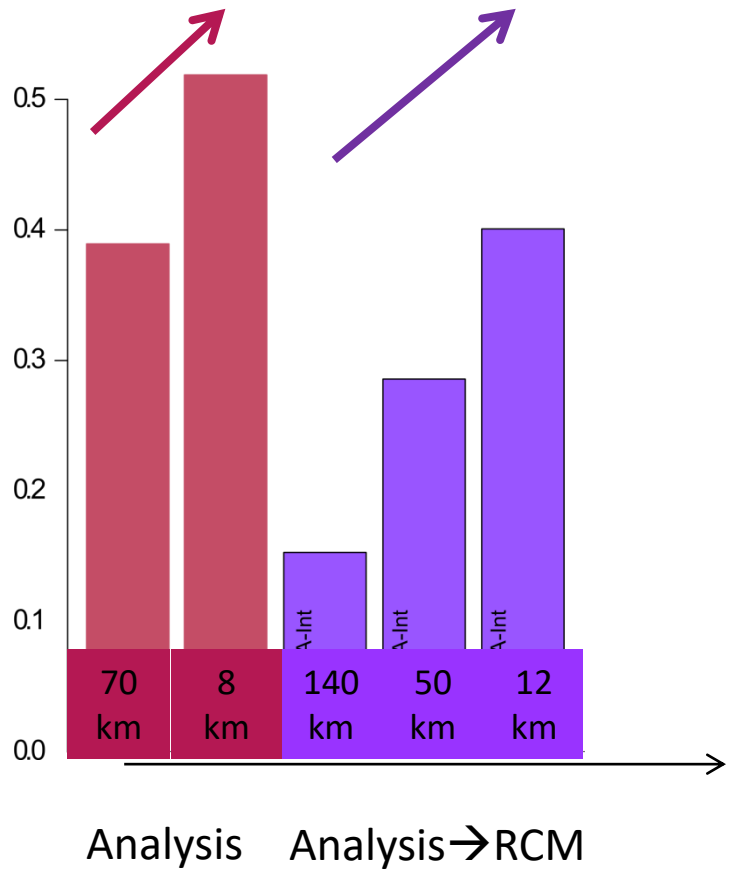


Fagus sylvatica

Martin-StPaul *et al* in prep

Spatial resolution in the modelling chain

Goodness of fit



Increasing the resolution improve the prediction of Fagus sylvatica distribution area with climate :

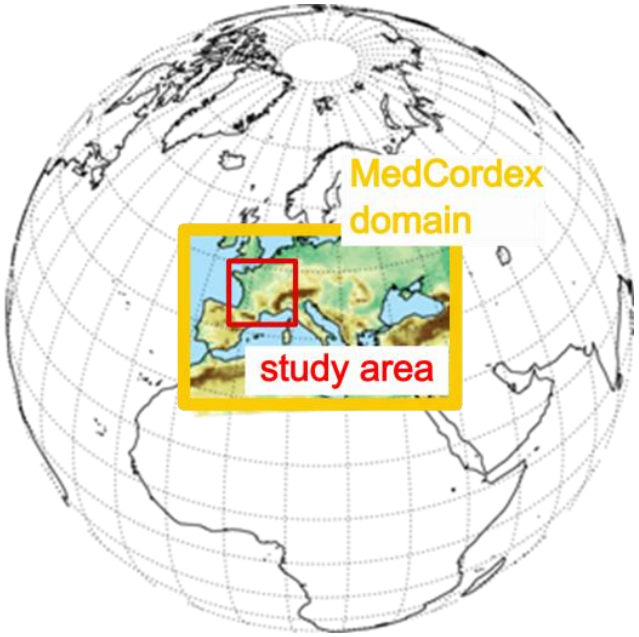
1- From « Analysis » or « Analysis→ RCM » climate

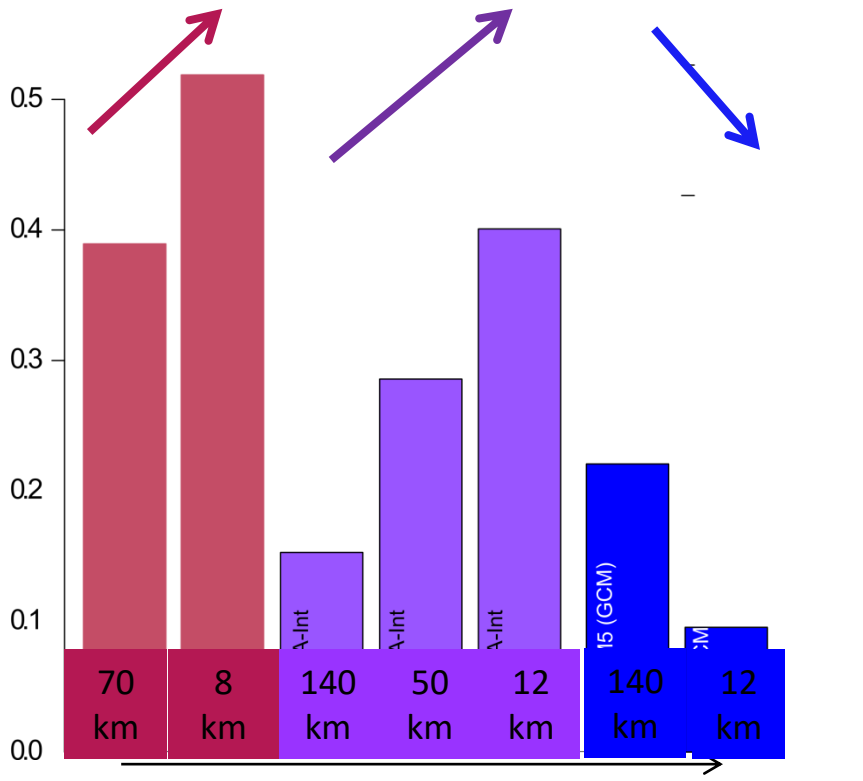
Martin-StPaul *et al* in prep

Spatial resolution in the modelling chain

Fagus sylvatica

Goodness of fit





Increasing the resolution improve the predictive power when :

1- « Climate data » are downscaled

2- But NOT when climate models are downscaled

Confirm
Gottler et al 2014 PNAS

Conclusions and simple questions regarding modelling choices for forest-impacts?

- Improving the spatial resolution with RCM driven by re-analysis (140km→12KM) helps to impact simulation
- A large part of uncertainities comes from GCM-RCM (« Garbage in – Gargbage out » though need to be tested with other GCM)
- Should we use multiple model knowing the large uncertainities

Thank you for your attention