SKÓGRÆKT RÍKISINS

LUNDS UNIVERSITET

SNS-meeting in Forest Inventory, Management Planning and Modelling
Egilsstaðir, Iceland 19-22. August 2008

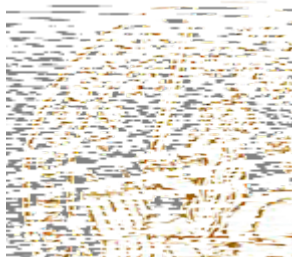
# Modelling the change in growth potential of the most used tree species in Icelandic forestry with climate change scenarios

Bjarki Þór Kjartansson

PhD student

Department of Physical Geography and Ecosystem Analysis

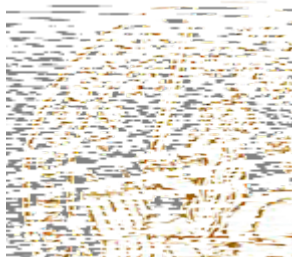
Lund University, Sweden



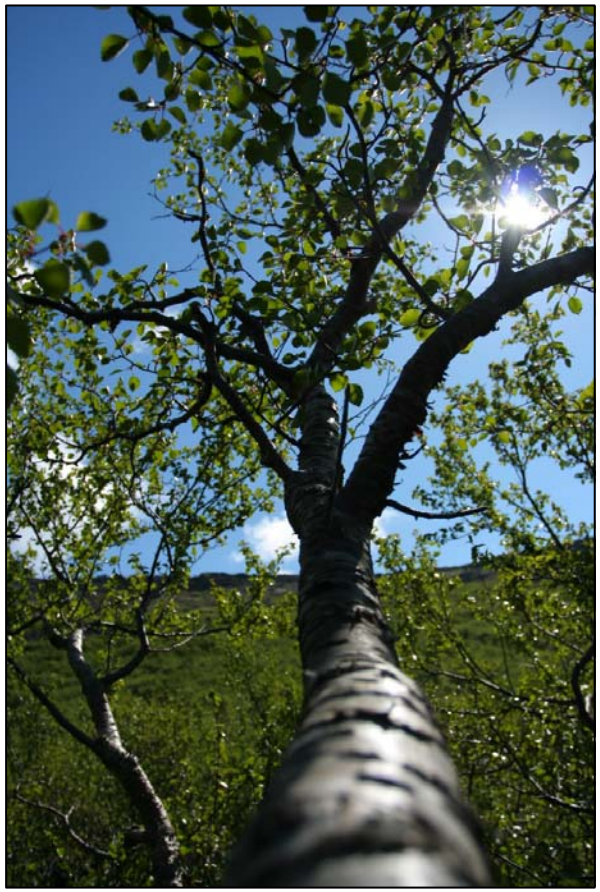
Egilsstaðir 20. August 2008

# Project description

- Estimate the distribution of growth potential of tree species under current and future climate in Iceland
- Spot possible new areas where afforestation might be feasible
- Forecast possible future changes in growth patterns and potential
- Examine possibility for new tree species under future climate in Iceland
- Quantify forest production in Icelandic agricultural landscapes



# Problems



These questions might normally be answered with direct measurements but Icelandic forests are :

- Very young – hard to estimate long term patterns
- Distributed – hard to compare between areas
- Exotic – prognosis can be difficult
- Lacking long-term distributed measurement series
- Statistically insignificant

# Methods

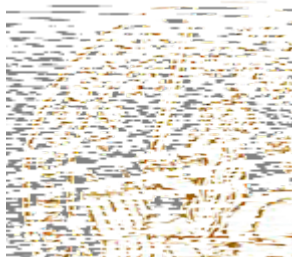
It was concluded that the best way to handle this question was to use Modeling : Dynamic Vegetation Models

The plan was set to use three different models to tackle the problem but only one has been set up yet

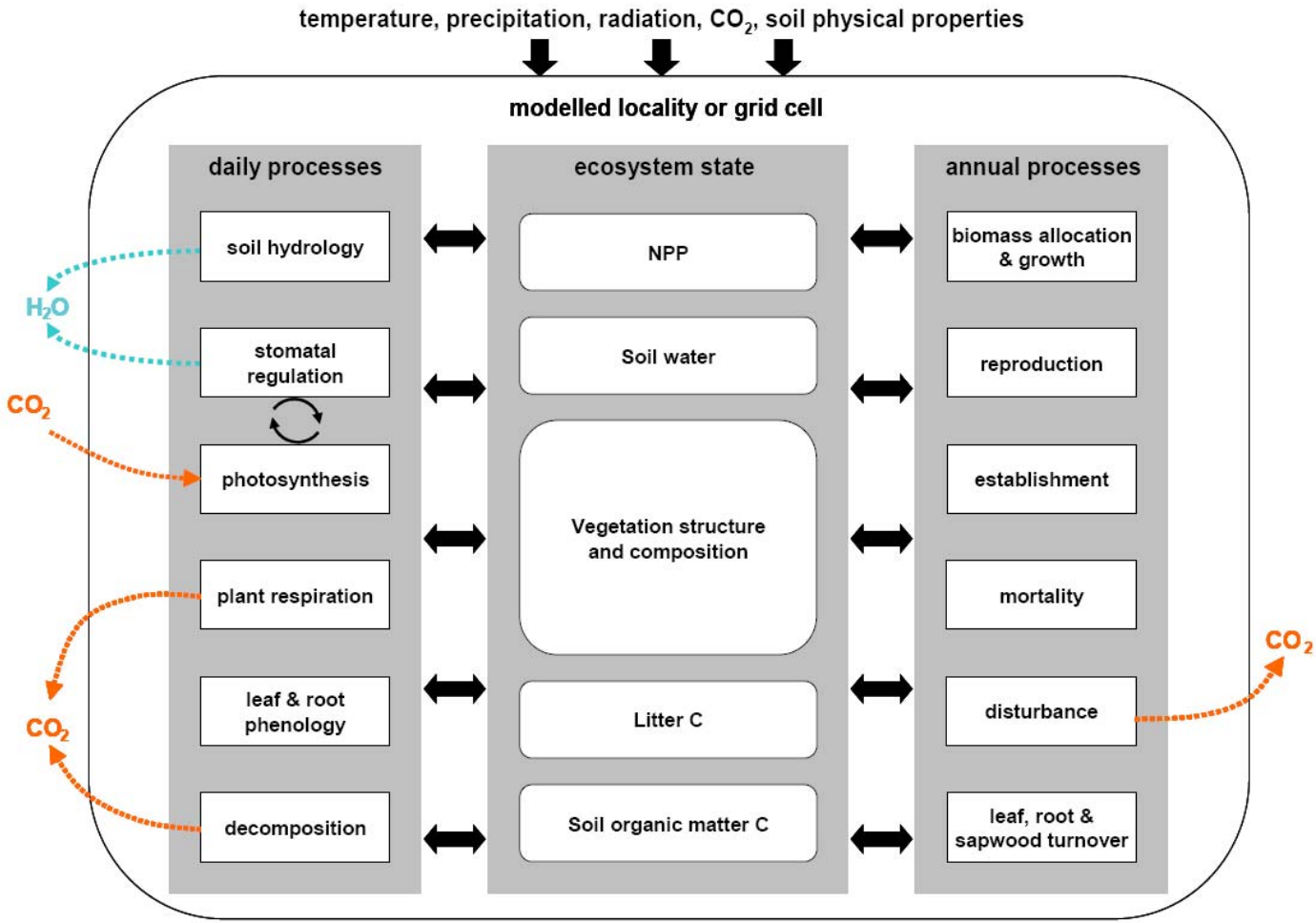
One model run has been completed with LPJ-GUESS

Lund – Potsdam – Jenna – General ecosystem simulator (LPJ-GUESS)

Analysis of the model run are underway



# LPJ-GUESS process framework



# Input parameters

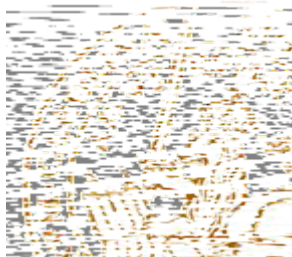
Mean monthly rainfall and temperature 1961-2002

Sunshine percentage 1961-2002

Soil texture properties – downscaled from FAO

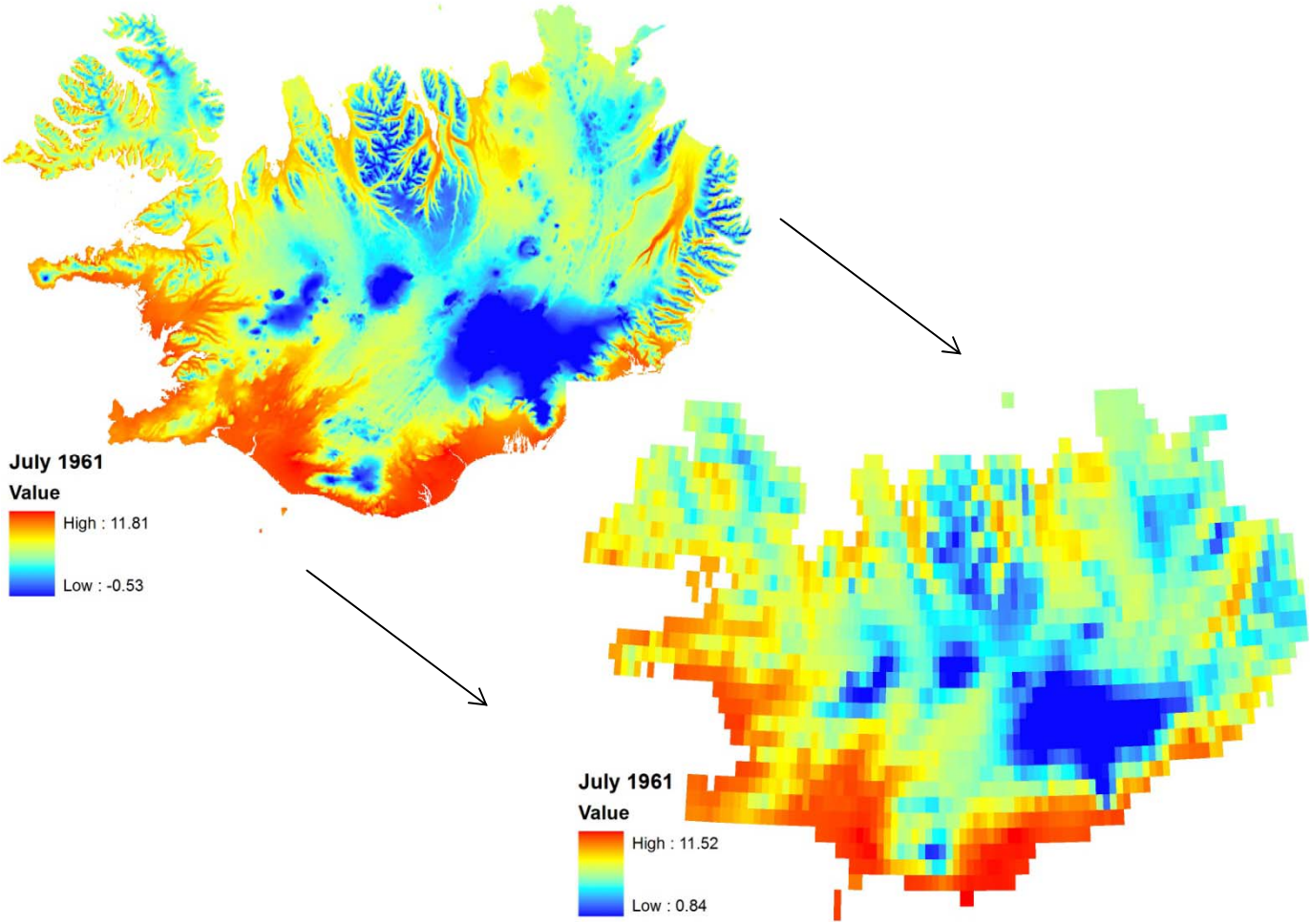
Readily available species parameters:

- Gray Alder -*alnus incana*
- European white birch – *betula pendula*
- Downy birch – *betula pubescens*
- Hazel – *corylus avellana* (common filbert)
- Norway spruce – *picea abies*
- Scots pine – pinus sylvestris
- European aspen – *populus tremula*
- Grass – C3 grasses



# Climate data handling

Temperature and precipitation data upscaled to a resolution of ~ 5km x 11km (0.10° or 6 minutes)



# Model setup

~ 5km x 11km pixels size

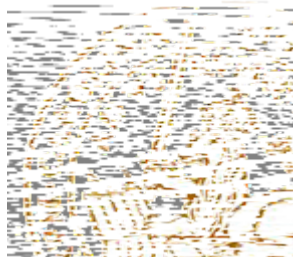
2200 pixels over Iceland

100 simulated patches per pixel

300 years of spin up time

Start from bare ground (no vegetation at start)

Competition between all species

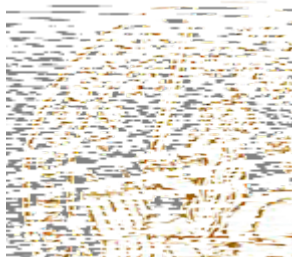


# Climate dataset test - Results

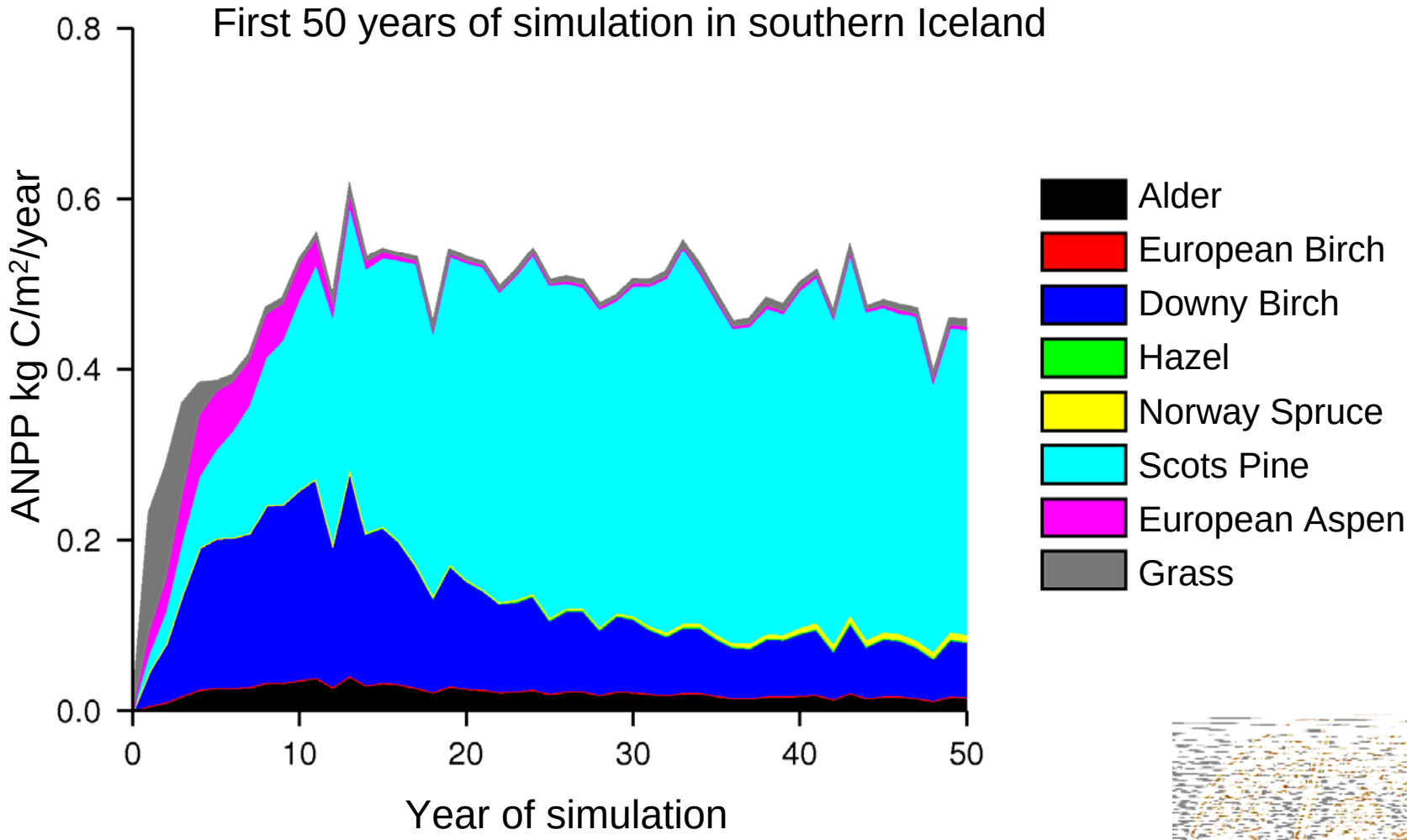
First look on results are promising – Climate data sets are valid

No comparison to ground mesurements has been made

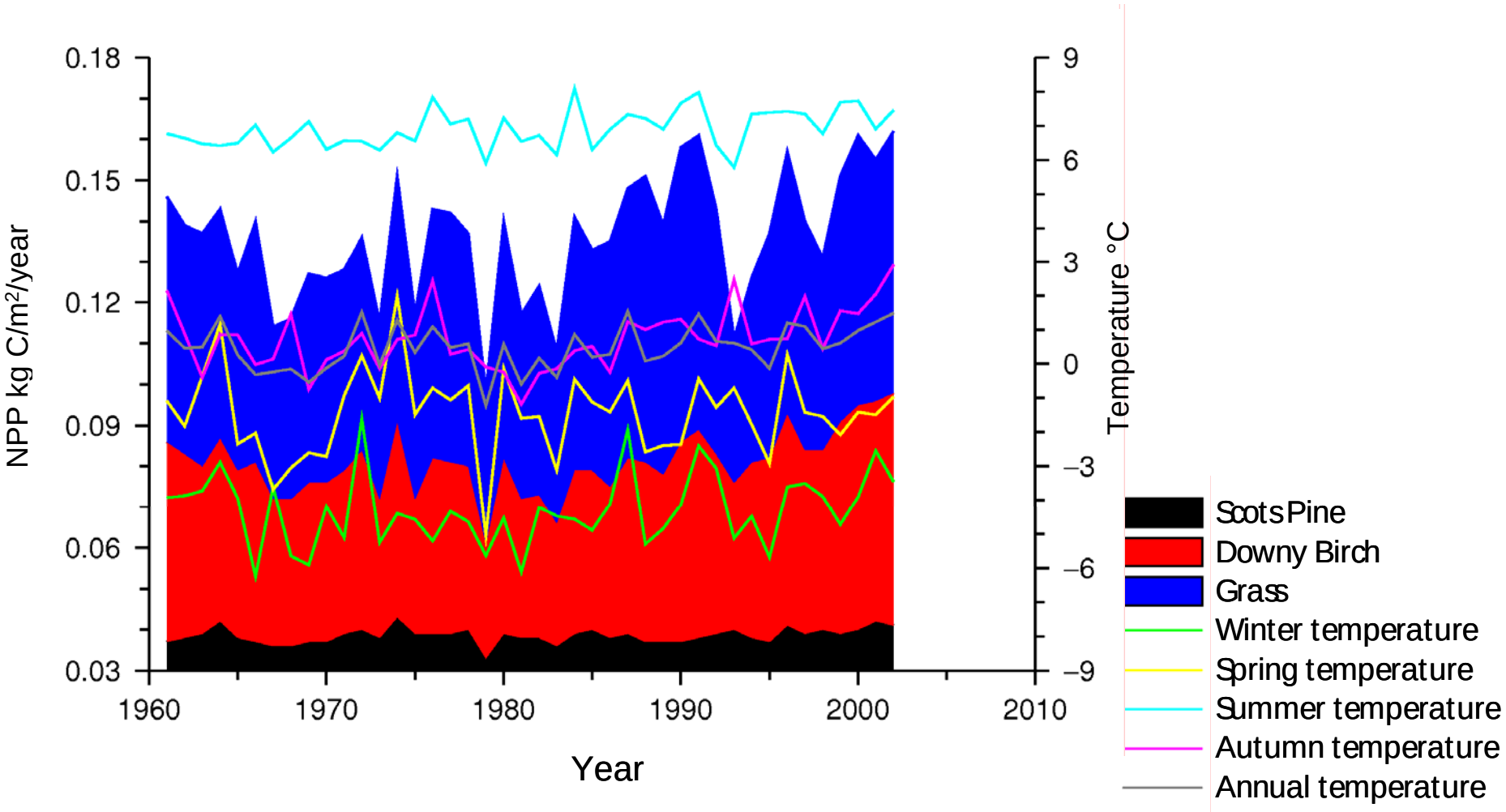
No masking to reality has been made either (waterbodies, glaciers or deserts)

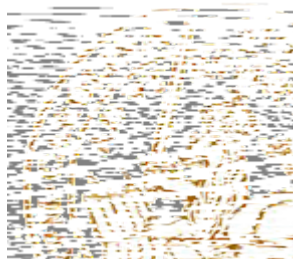


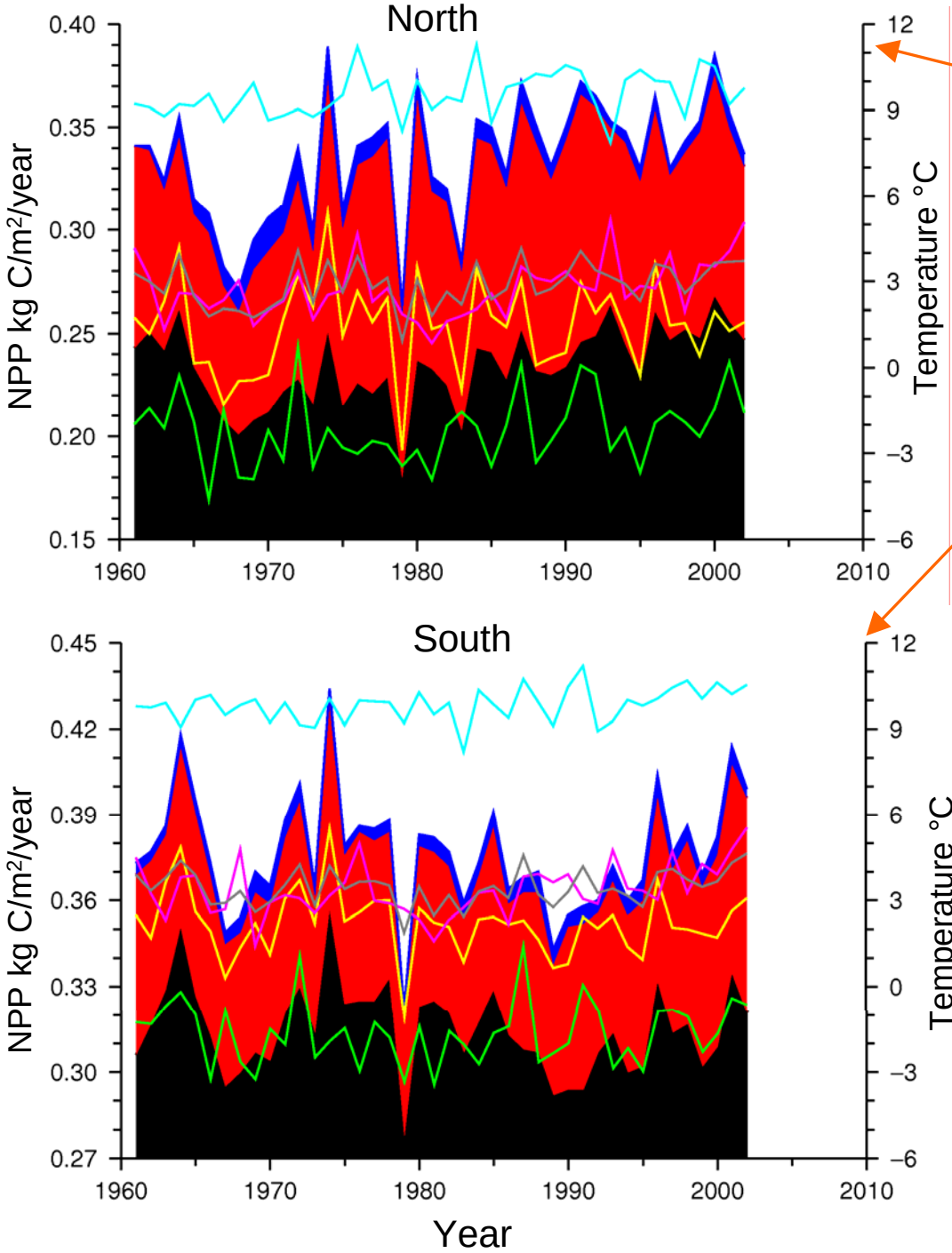
# Species succession

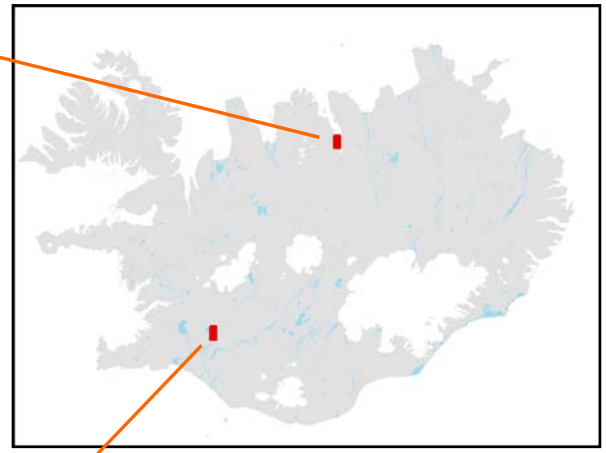


# Temperature and net primary production in Iceland

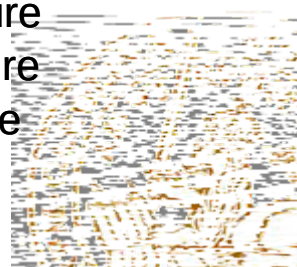


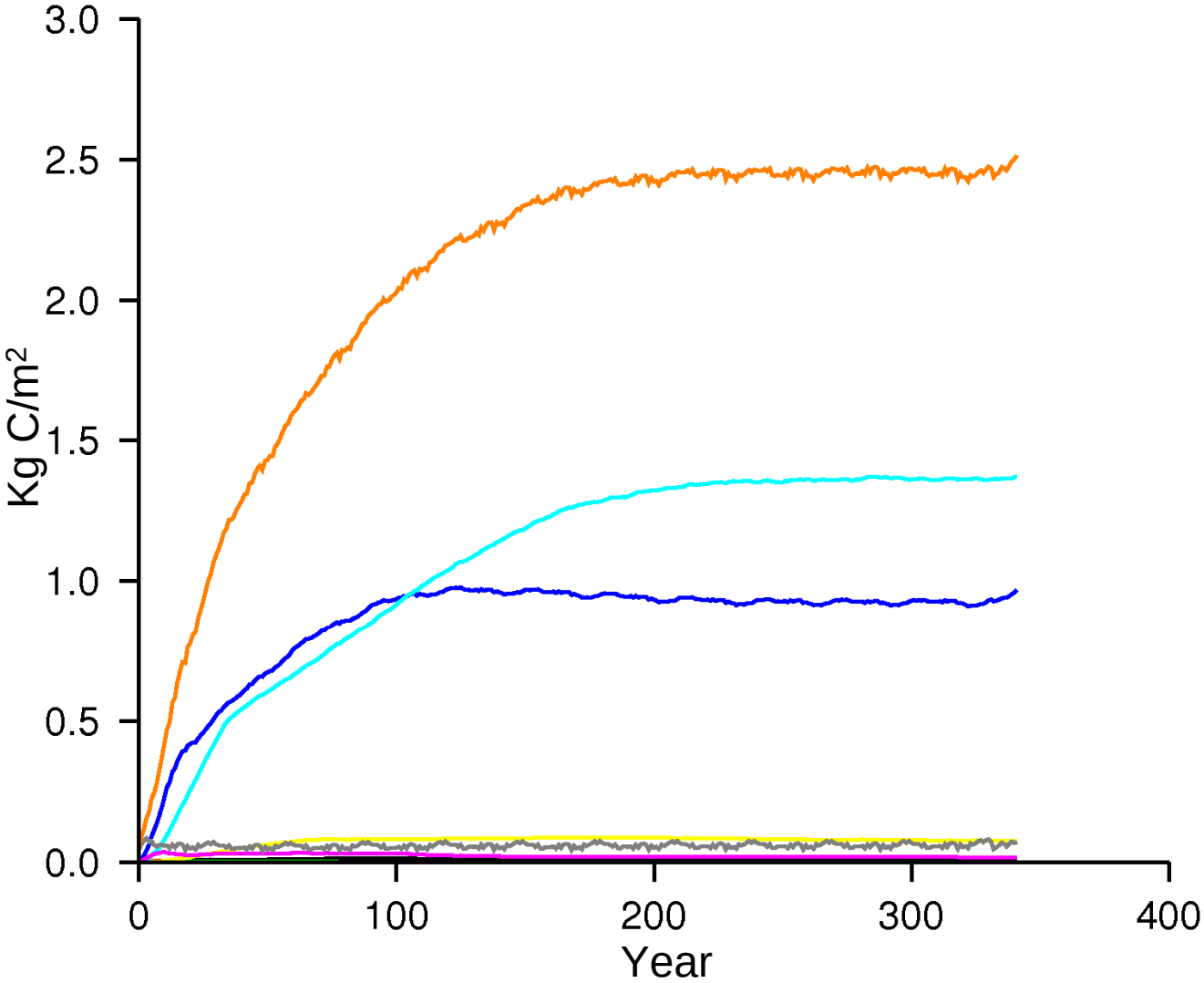


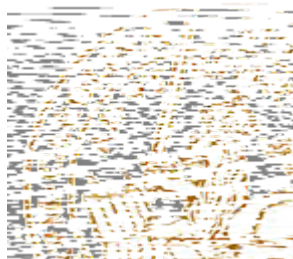



Inter annual change in temperature and net primary production in north and south Iceland

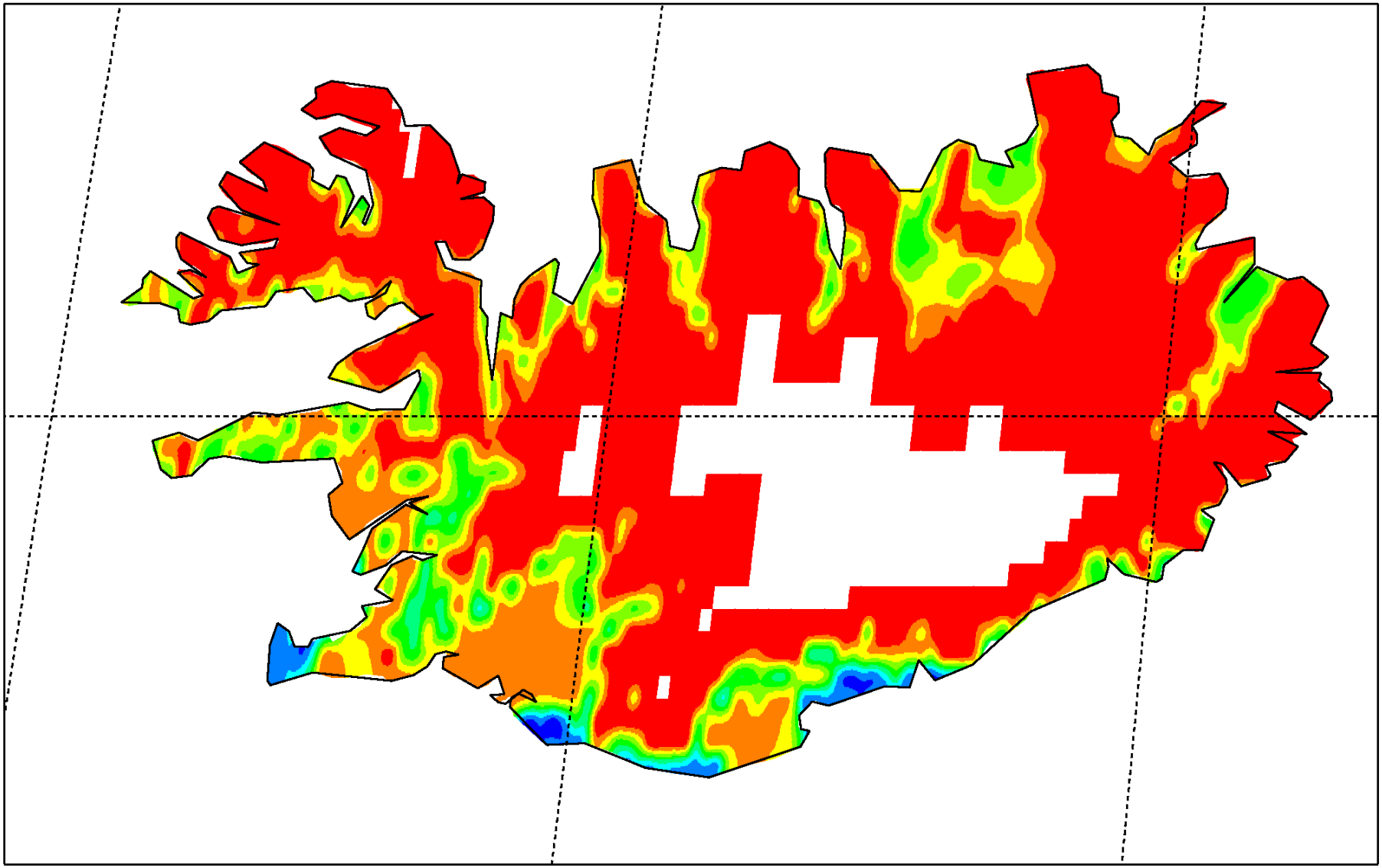


# Vegetation Carbon mass



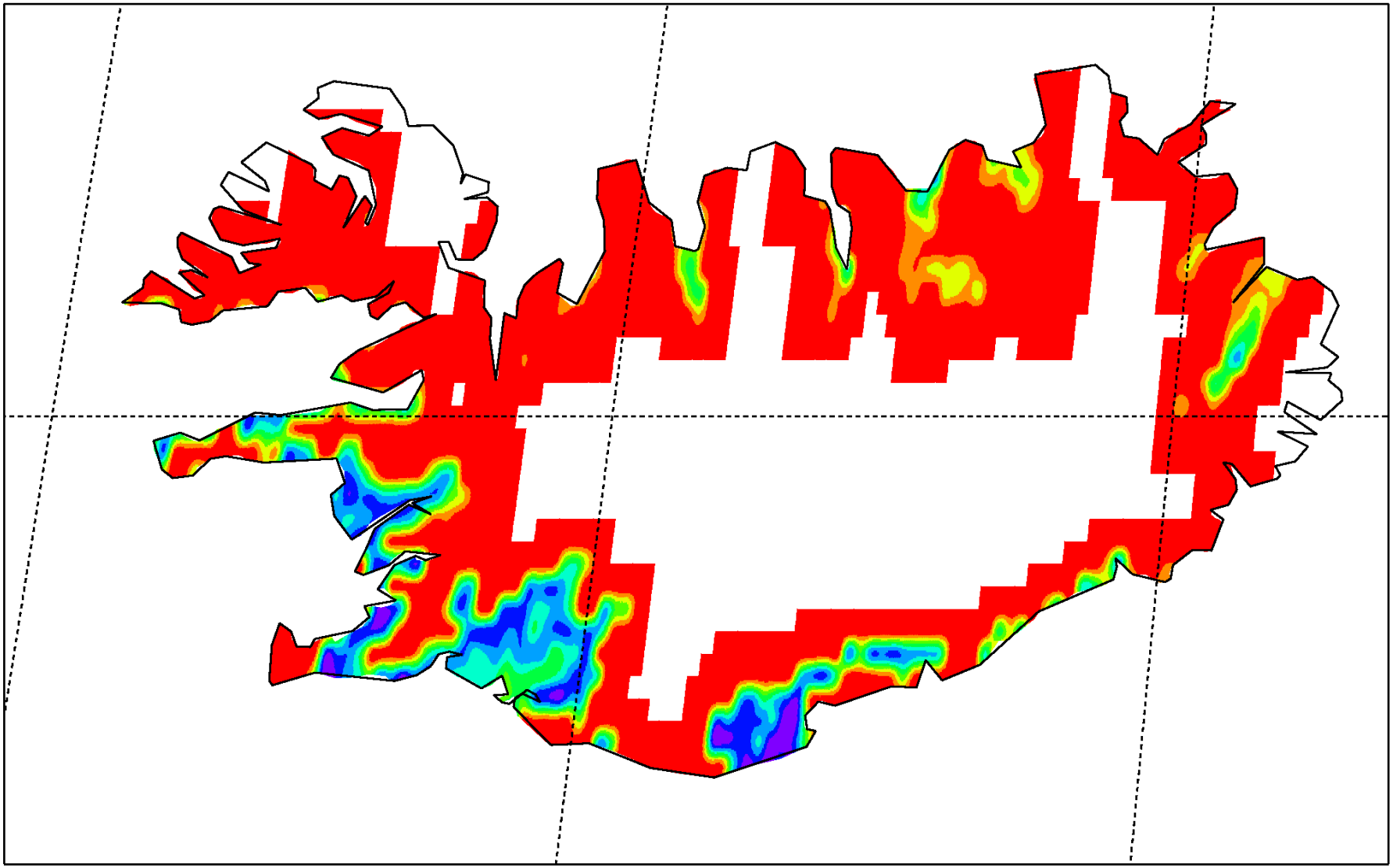
# Birch volume distribution



Aboveground volume $m^3/ha$ (stem and branches)

0 20 40 60 80 100 120 140 160 180 200

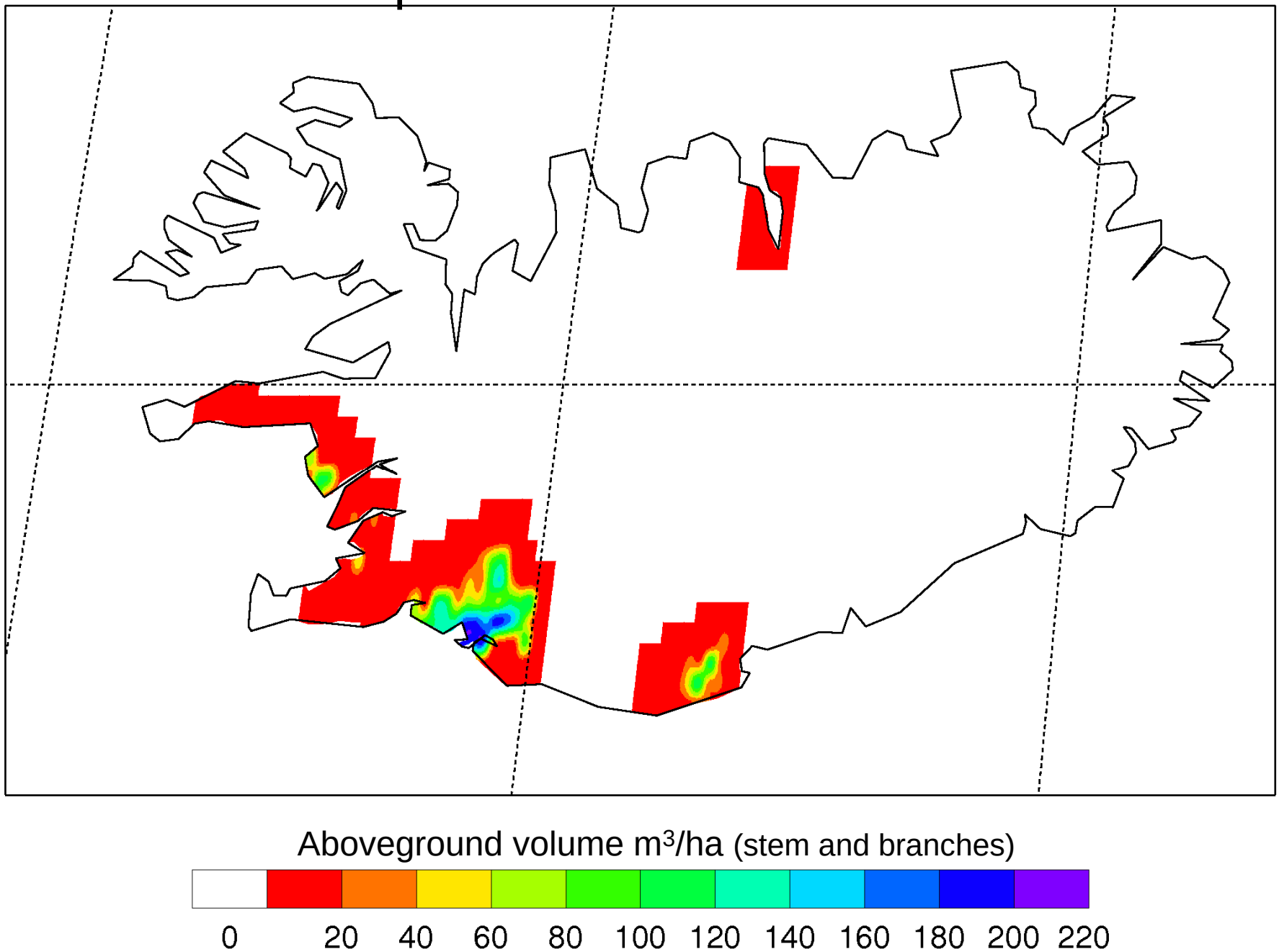
# Pine volume distribution



Aboveground volume $m^3$/ha (stem and branches)

0 50 100 150 200 250 300 350 400 450

# Spruce volume distribution



# Future plans

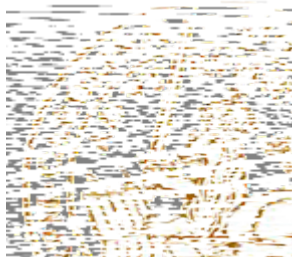
Refine climate data to take account of topographical variations in Icelandic landscapes

Acquire longer/better climate series – especially radiation

Add more species, new and older to the model runs

Run model with individual species – no competition between species

Produce results!



# Questions, comments