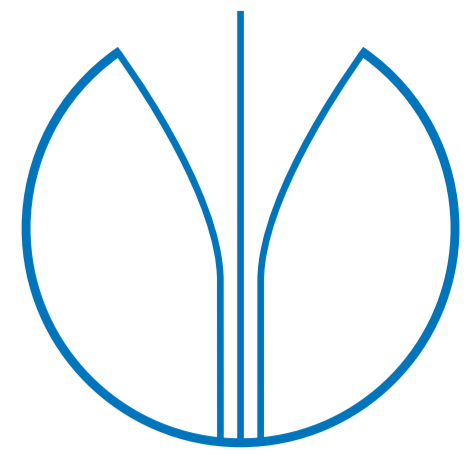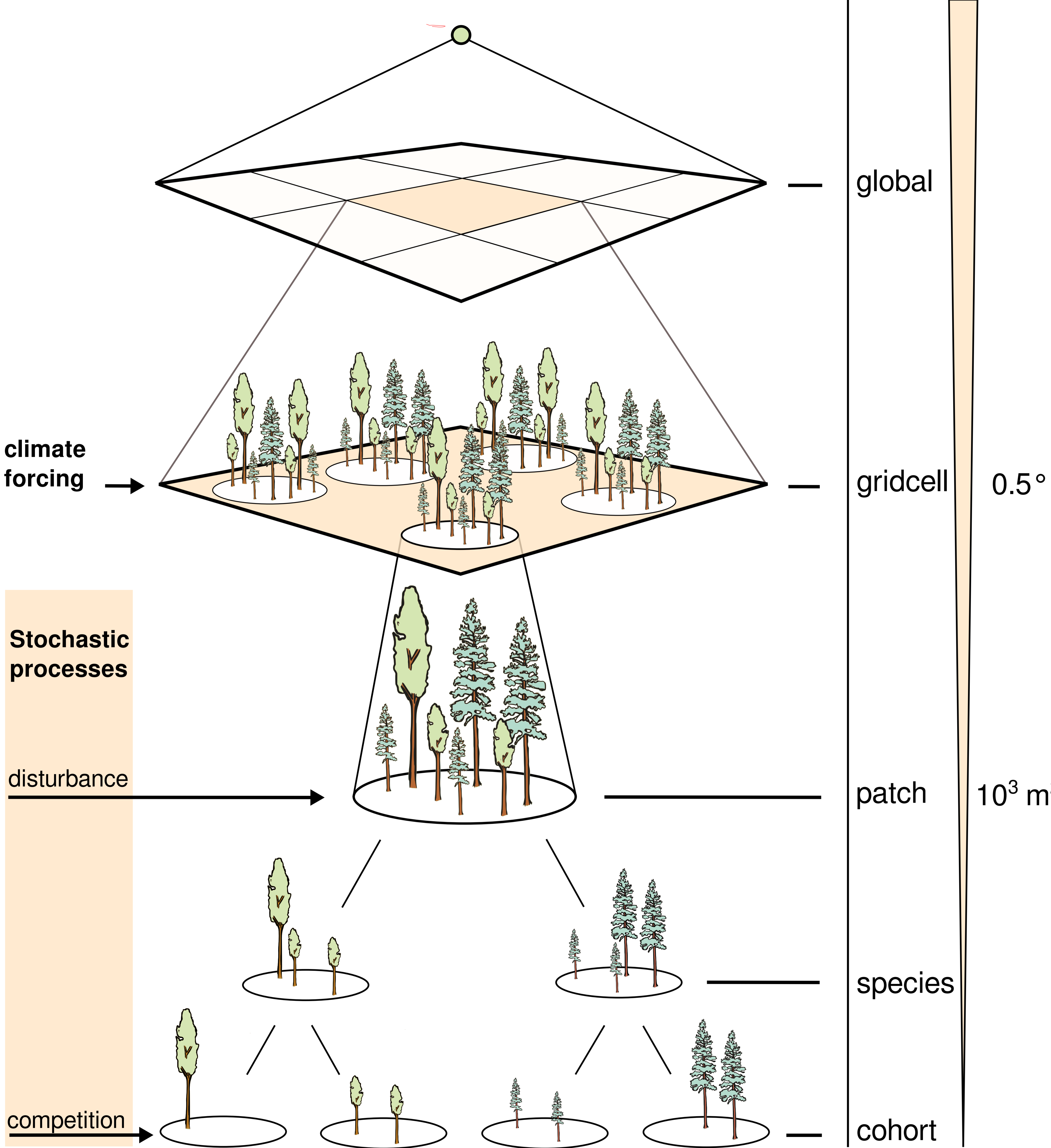# How does stochasticity propagate through the spatial scales of a global dynamic vegetation model?

Lucia S. Layritz ° | Prabha Neupane ° | Anja Rammig °   ° TUM School of Life Sciences, Munich, Germany
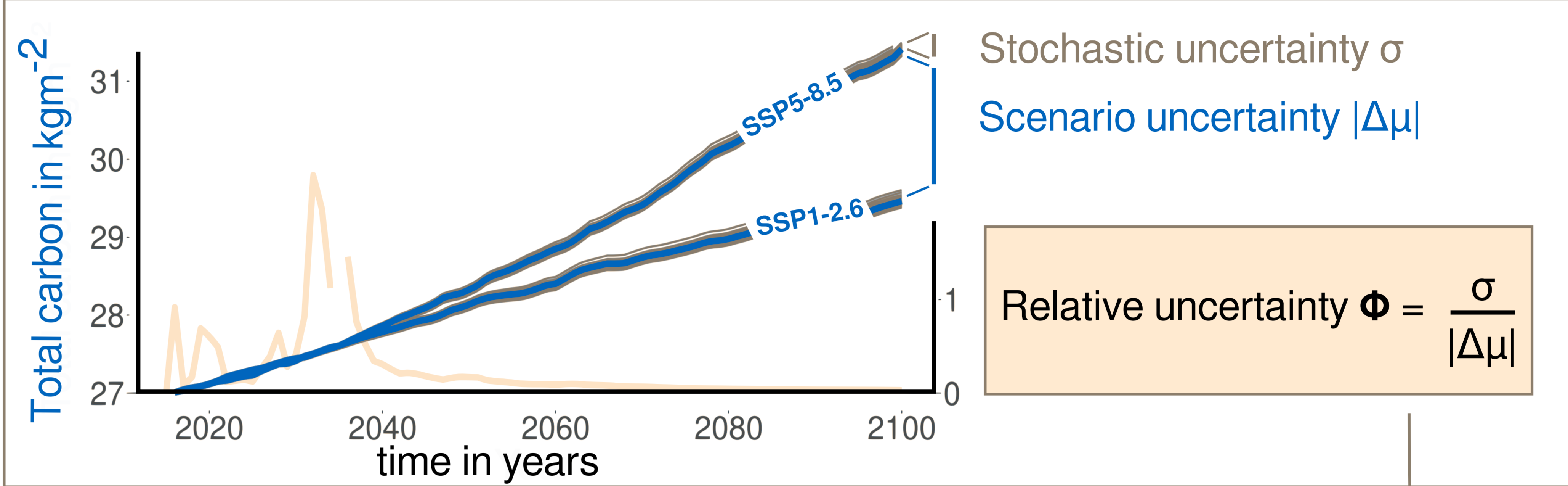
LPJ-GUESS - A multiscale stochastic global dynamic vegetation model

Spatial scale

Stochastic processes

climate forcing

disturbance

competition

global

gridcell   0.5°

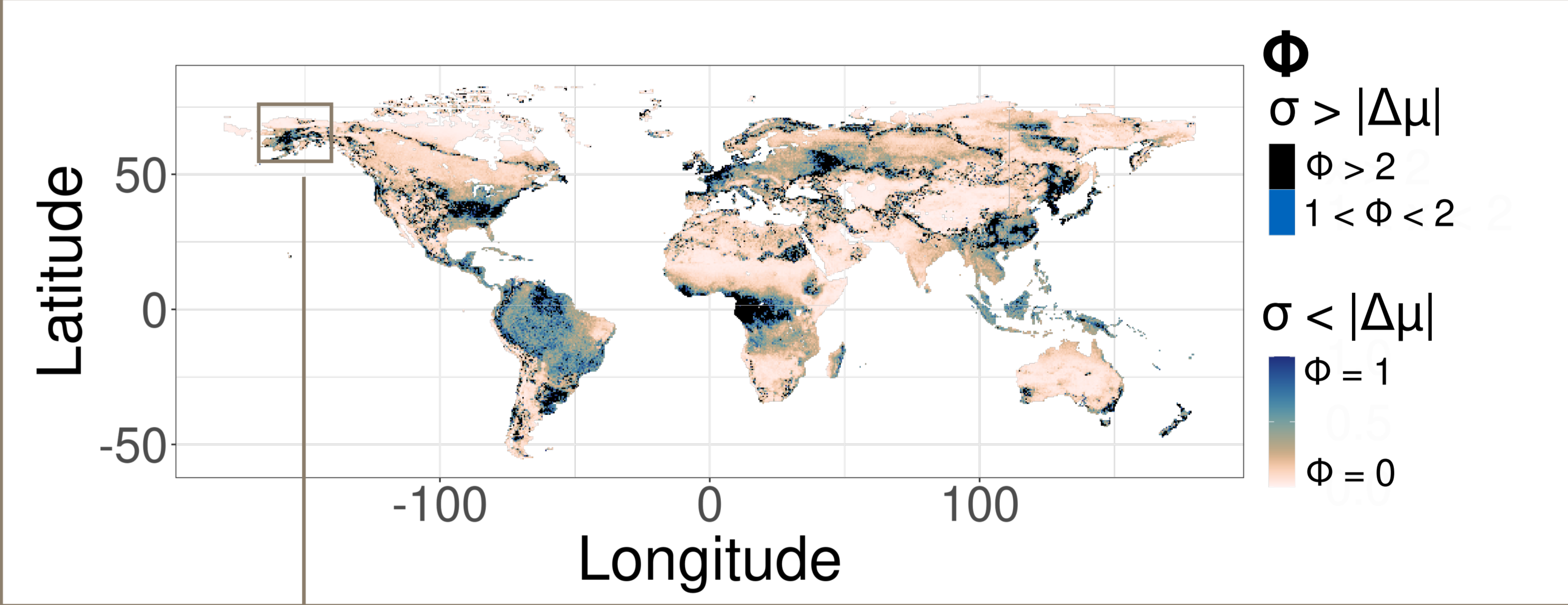patch 10^3 m²

species

cohort

The contribution of stochastic vegetation dynamics to model uncertainty of the terrestrial carbon sink

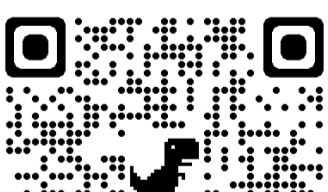Relative uncertainty is small on the **global scale**

Stochastic uncertainty σ

Scenario uncertainty |Δμ|

Total carbon in kgm⁻² — SSP5-8.5, SSP1-2.6

$$\text{Relative uncertainty } \Phi = \frac{\sigma}{|\Delta\mu|}$$

On the grid cell level, areas of high relative uncertainty appear in **tropical regions** and **ecotones**

Φ
σ > |Δμ|
Φ > 2
1 < Φ < 2
σ < |Δμ|
Φ = 1
Φ = 0

Noise-induced transitions appear on the patch scale

deterministic
stochastic
gridcell
patches

Needleleaf fraction

patch is resilient to disturbance   patch is not resilient

time in years (SSP5-8.5)
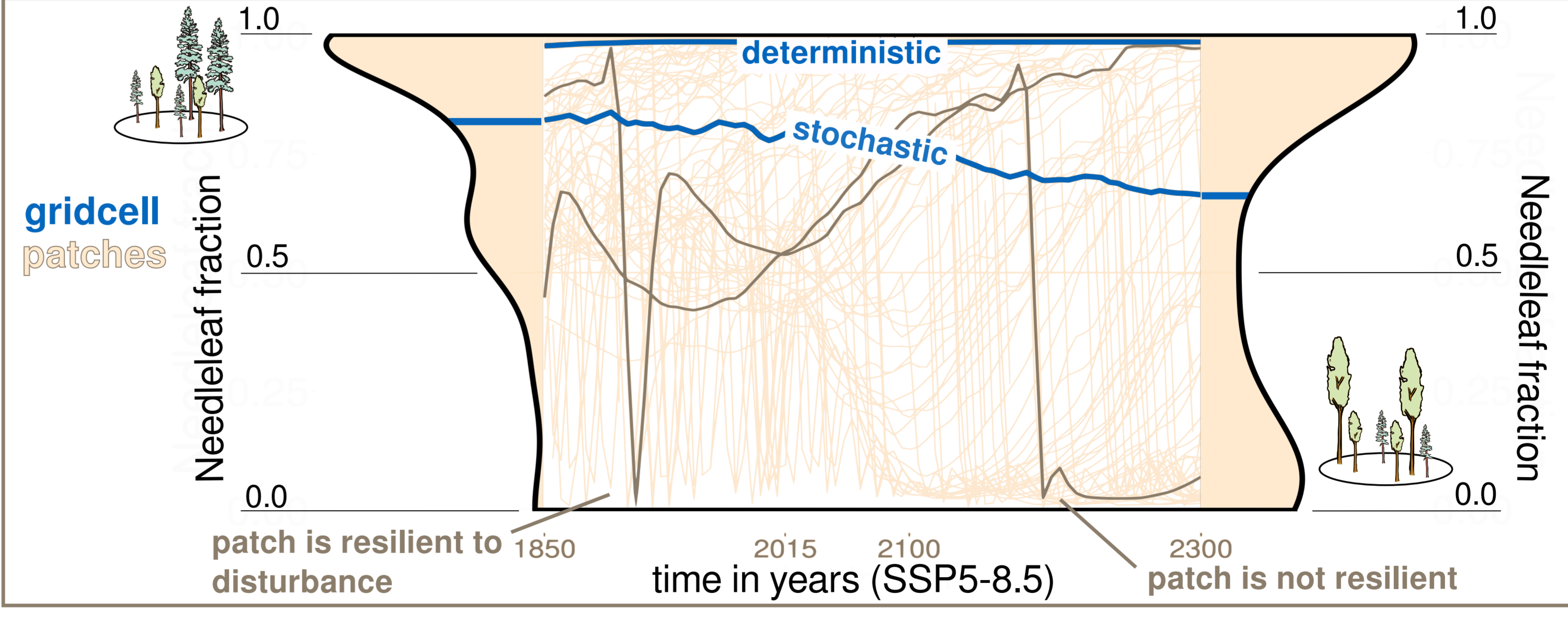
Local vegetation dynamics are strongly influenced by stochasticity and not always adequately captured by spatial aggregation.

Contact me

@lucialayr
lucia.layritz@tum.de

Scan for abstract!