

Objectives

Generic framework for modelling of plant communities

The effect of phenotypic plasticity on plant community dynamics

Individual level

Community response to drought event

Literature review

Context: mountain grasslands and climate change

Diversity and coexistence

Effects of diversity

productivity

resistance ?

Ecosystem services and complementarity

Mechanisms for coexistence

main theories: niche, neutral, individual based. -> scale and dimension dependant.

chesson

Spatial and temporal variability

trade-off, strategy space, and variability.

in the end it's rarely direct interaction but capacity to respond to stress and indirect interaction through resource pools.

global change and community dynamics: theory and empirical results

Intraspecific variability

frame of reference: deep traits vs shallow traits. definition of functional trait.

source of intra specific variability: genetic vs ontogeny vs plasticity (epigen)

effect on niche and interactions: effect on coexistence

-> plasticity a special form of ISV

Understanding phenotypic plasticity

adaptive intraspecific variation

cost and limits

effect on coexistence and community

Existing modelling solutions/approaches to question global change effect on vegetation community

Modelling vegetation - traits and strategies

traits & strategies

existing models: a gap to fill

coexistence processes

Generic model for plant community dynamics

Paper 1:

Introduction

Strategy space and allocation pools

Leaf economic spectrum + Shipley

Model overview

pseudo-code and routine

allocation

mechanism and stochasticity

5 types of allocation

Plasticity: between species memory and individual experience

concepts

equilibrium, resource use, resource availability, condition estimation

comparison of different algorithms

the two sides of the performance/fitness: equilibrium and tissue efficiency

age vs biomass.

Parameter filtering and sensitivity analysis

Obj: give confidence in the model, demonstrate is able to reproduce simple growth pattern.

Obj2: have a better idea of plasticity on growth. growth plastic and non plastic parameter filtering: can we distinguish species thanks to species specific parameters instead of shared parameters.

does plasticity make it easier ?

Impact of plasticity related parameters.

Community dynamics parametrisation

Obj: demonstrate that the model is able to reproduce community dynamics (as it was designed for).

Find parameters that allows coexistence (suggest plasticity should allow a diversity of strategy). SLA and height data.

Phytosociology for 10m quadrats.

Model's properties and individuals response

(Related to the notions cited above, like performance decomposition)

Craft a trade-off and phenotypic map

Can memory be related to strategy and active/structural ratios in shoot and roots ?

Niche response

Obj1: understand how resource use mechanisms and allocation algorithms shape the environmental potential niche in the context of the model.

H1: strategy and memory affect niche in two ways if we suppose they are independent: shape and position. Strategy mostly affect shape (width and height) while memory (and so root:shoot ratio) affect mostly position.

H1': there is strong link between strategy and memory in the case of optimisation allocation that increase niche height and might reduce its width.

Obj2: understand the role of plasticity on the niche and if the effect is the same for all strategies/memories.

H2: the plasticity increase niche width but not height (as phenotype is optimum at the center of the niche where memory match the resource availability).

Stability and efficiency trade-off. Niche height and width and relationship with the strategy. How does plasticity affect that? Does it increase the height and widen niches? What does that mean for coexistence?

Hopefully higher niche would go with unstable niche.

Transitivity and competition

1 vs 1 interactions

Is the resource competition transitive? How does niche widening impact that, does plasticity change competition interaction. Is it related to the trait distance? (don't think so)

The effect of phenotypic plasticity on plant community dynamics

Hypothesis on the cumulative effect on niche and interactions.

Individual resistance and resilience against drought events

Amplitude and length of the event :

- severity effect reduced by lower τ ?

- resistance versus resilience: H0: conservative strategy have higher resistance, H1 : low τ allows for re-equilibrium and increase resistance (low amplitude and long length. H2: high τ allow to avoid dead-end situation during short severe drought (high resilience)

Community response to drought event

coexistence effect vs resistance/resilience effect

uniform vs heterogeneous (plasticity wise) community response H1: