Intraspecific trait distribution along environmental gradients

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Team NZ: Sabine Rumpf, Julie Deslippe, Justyna Giejsztowt, Cath Dickinson
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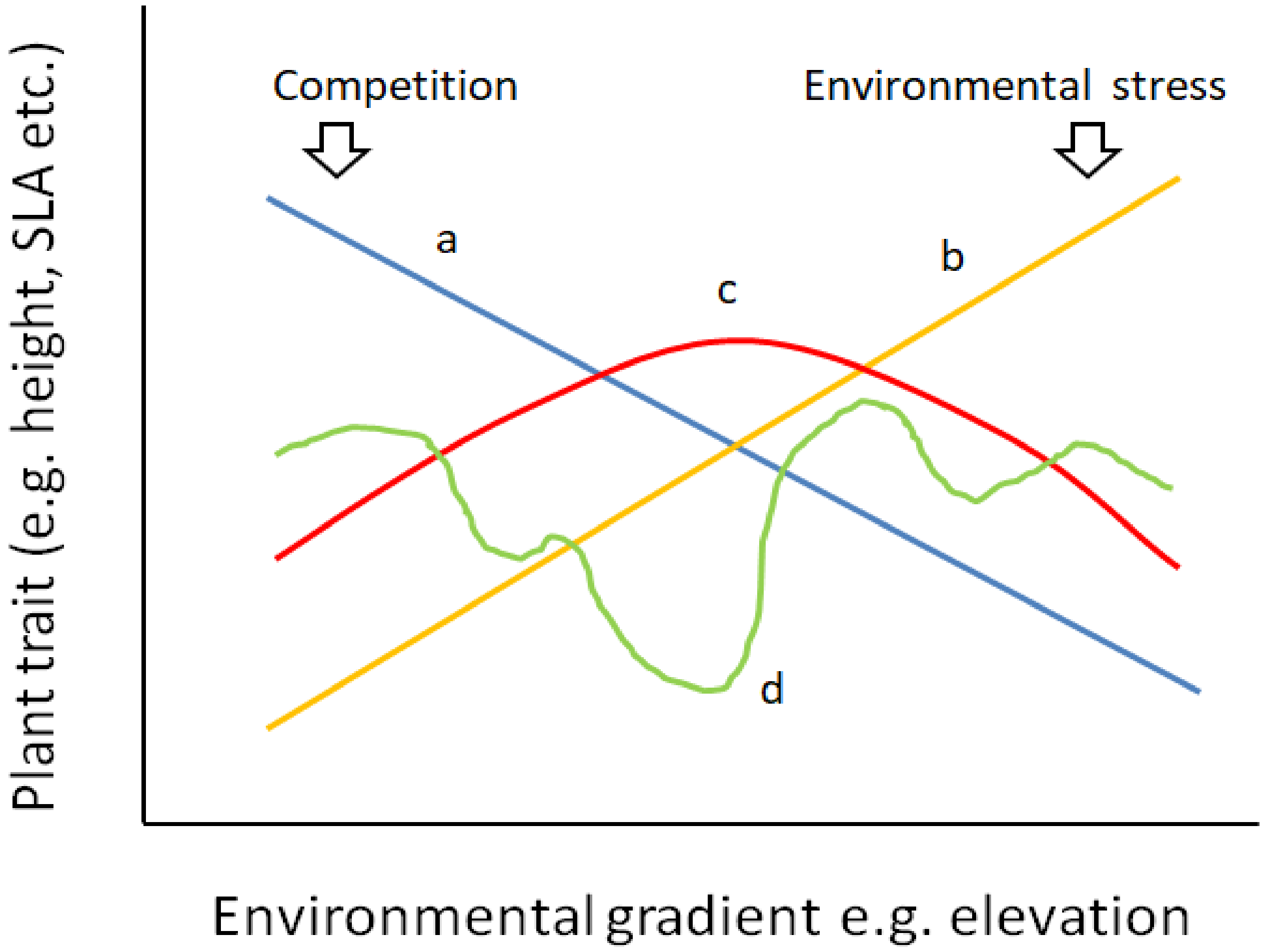
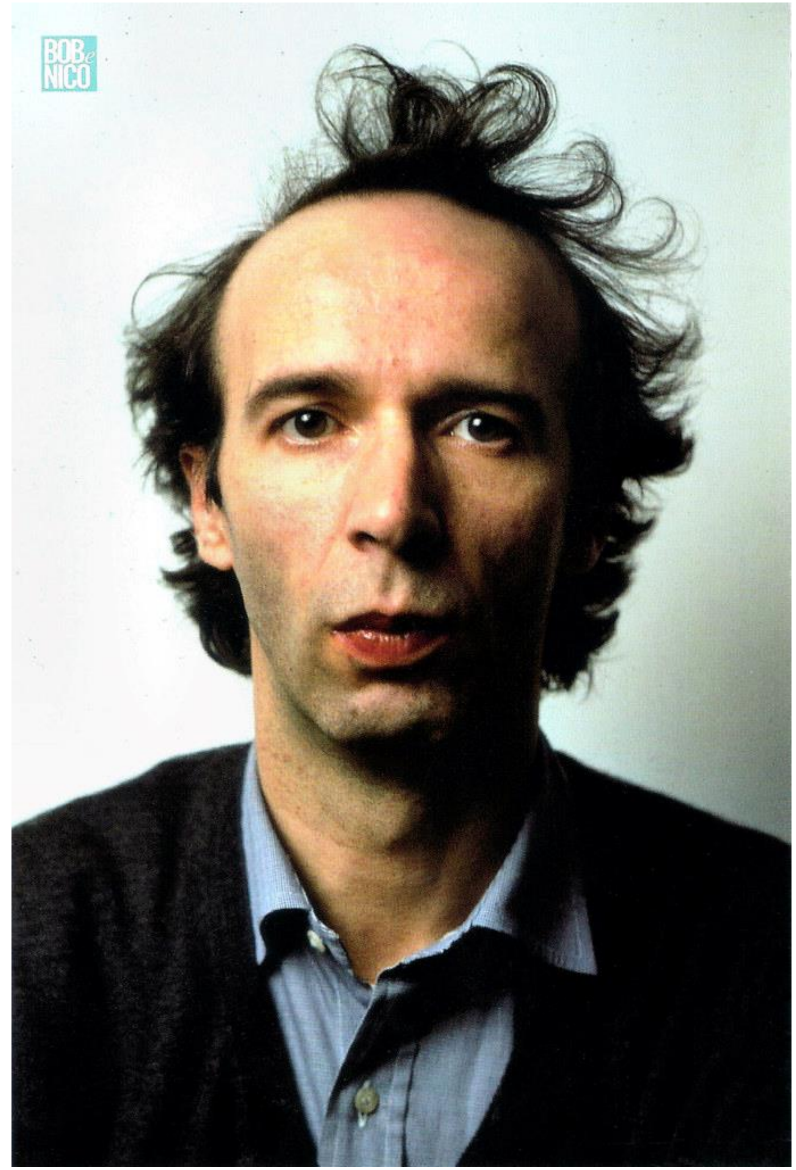


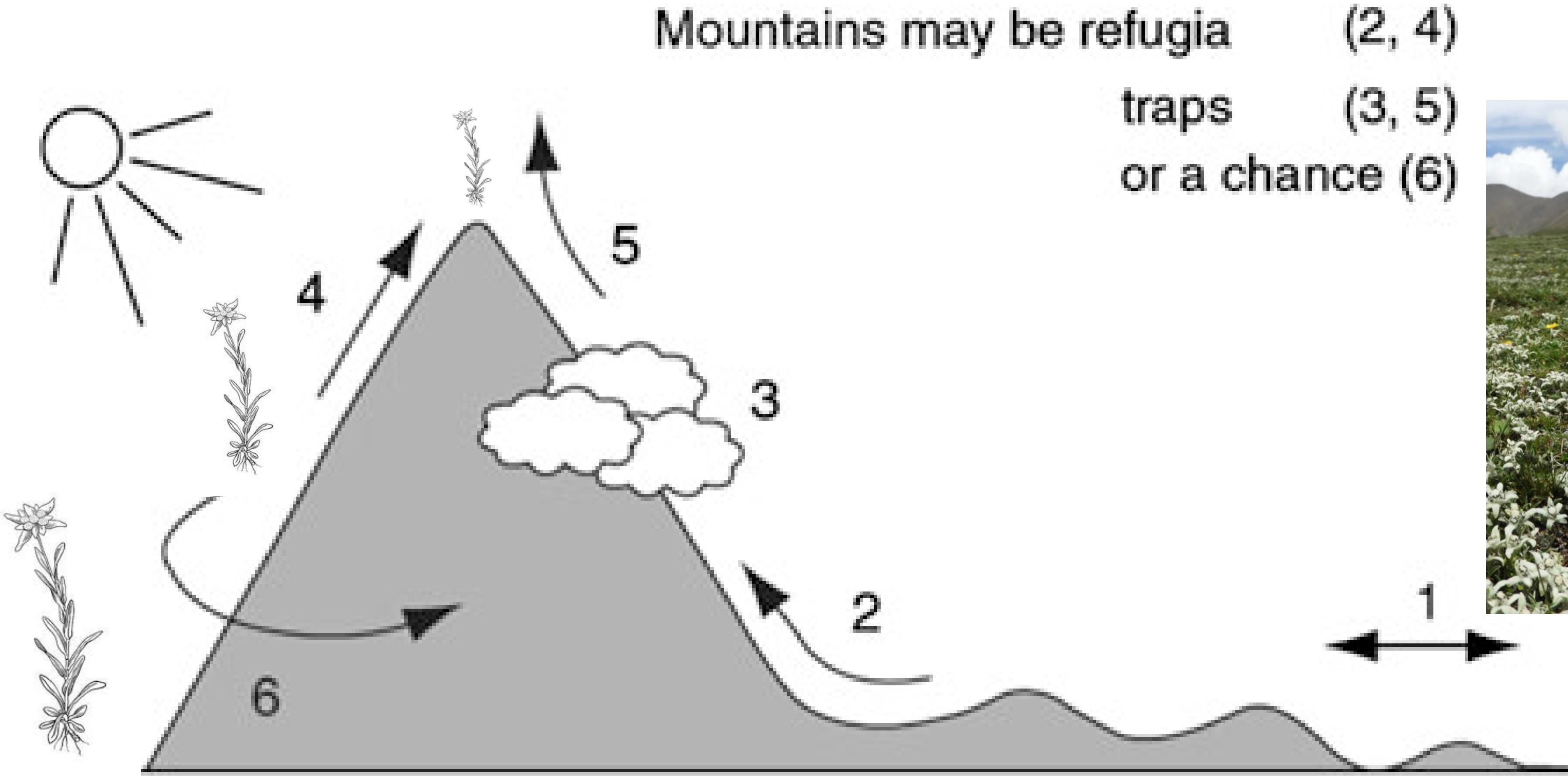
Intraspecific variability



Intraspecific variability in Arctic-Alpine plants

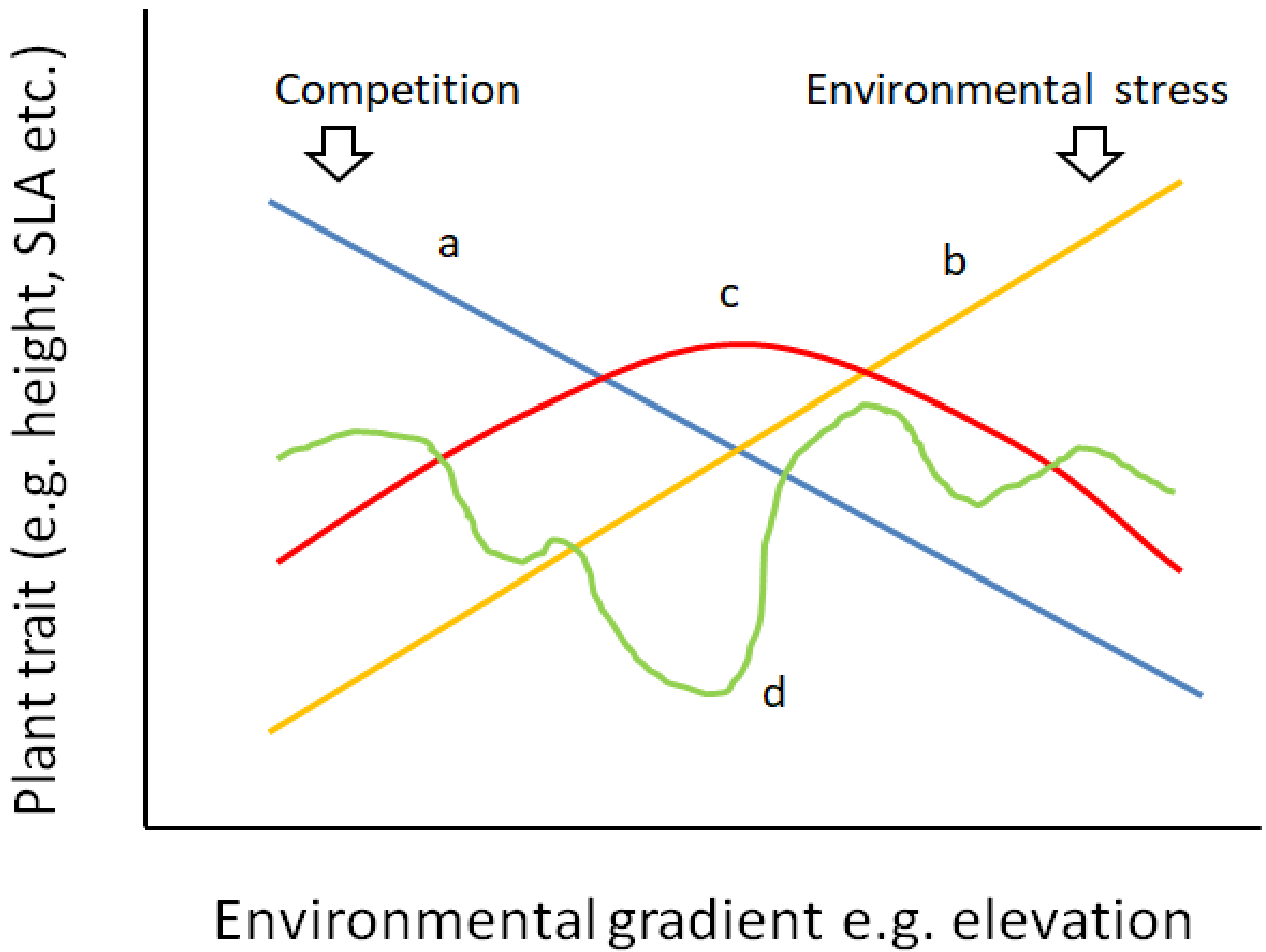
Photo: LTER

Intraspecific variability and climate change

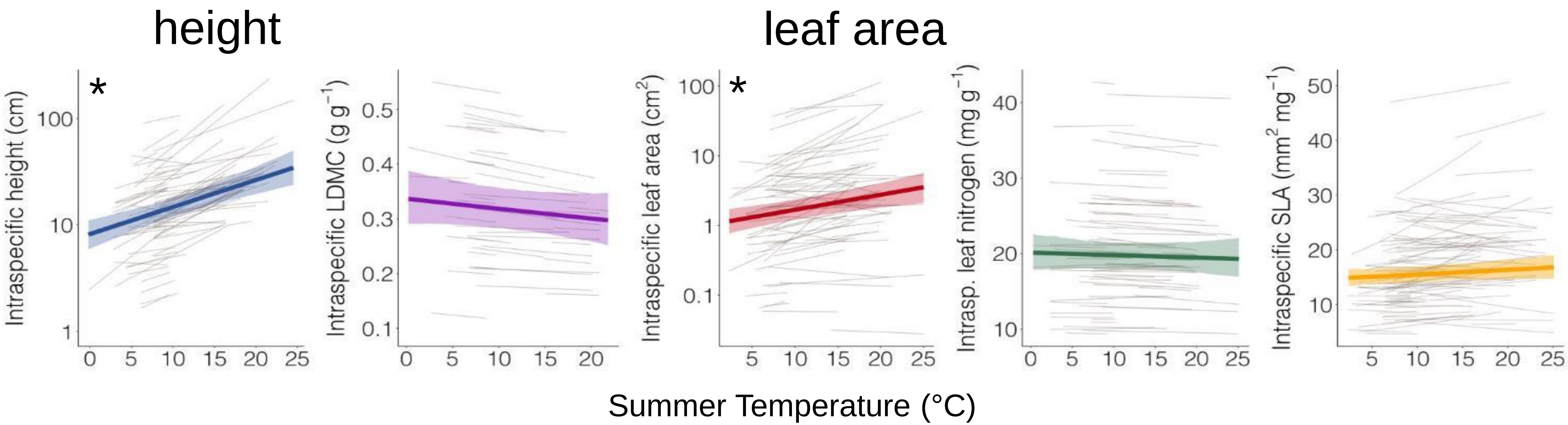


from Körner (2013)

Intraspecific trait distribution along environmental gradients



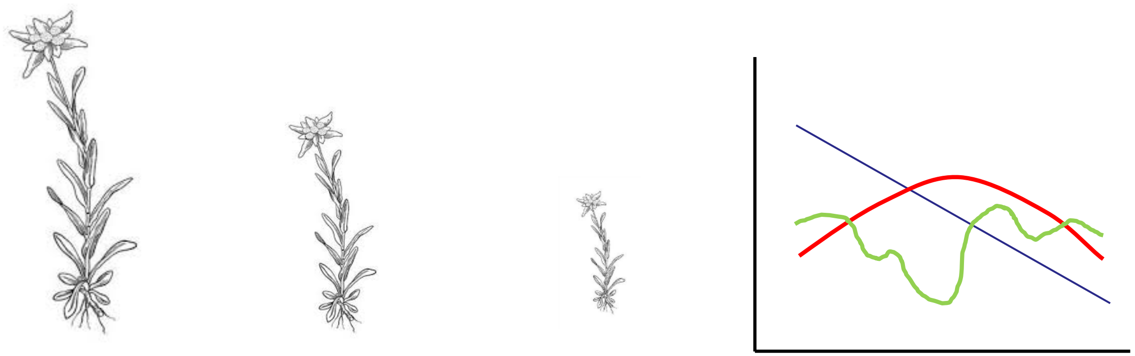
Intraspecific trait distribution in data from TTT



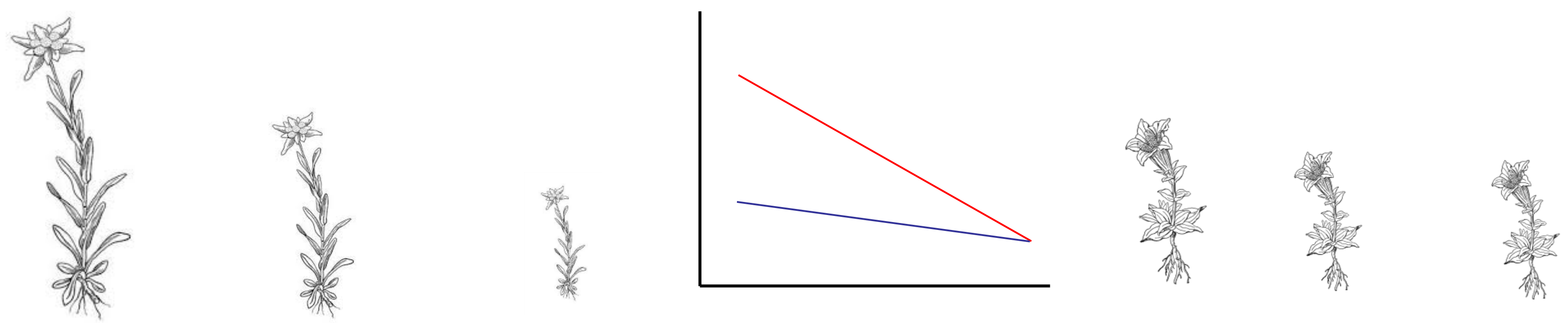
Bjorkman et al. (2018)

Questions

What are the **patterns of traits** of plant species growing along a steep environmental gradient?



How are trait patterns related to **species' potential vulnerability** to climate change, as indicated by current range, range shifts, abundance changes, expert knowledge?




Sampling in 3 countries on 11 mountains each
Plant populations every 50 – 200 m, depending on available range
6-10 plant species per country
Species covering a range from high- to low-alpine

Swiss plants

Ranunculus glacialis, Silvrettahorn

Leucanthemosis alpina, Piz Tschierva

Festuca halleri, Silvrettahorn

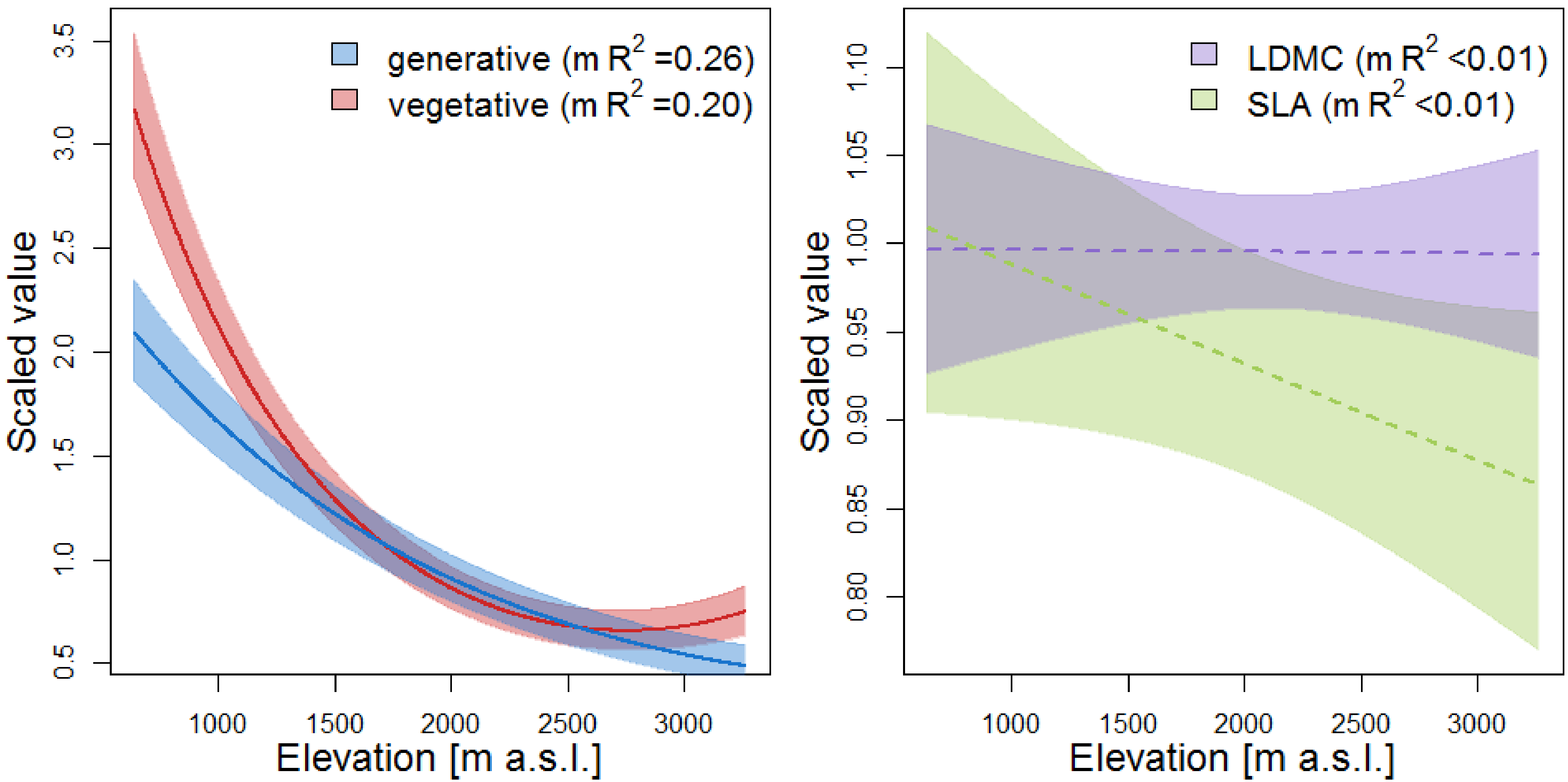
Campanula scheuchzeri, Piz Tschierva

Helictotrichon versicolor, Furkapass

Poa alpina, Furkapass


Vegetative and generative plant height
Leaf Dry Matter Content LDMC
Specific Leaf Area SLA
Rosette and patch size
Mini-relevé: %cover vasc. plants, open ground etc.
Tallest neighbour in relevé, ID and height
Population size, habitat characteristics

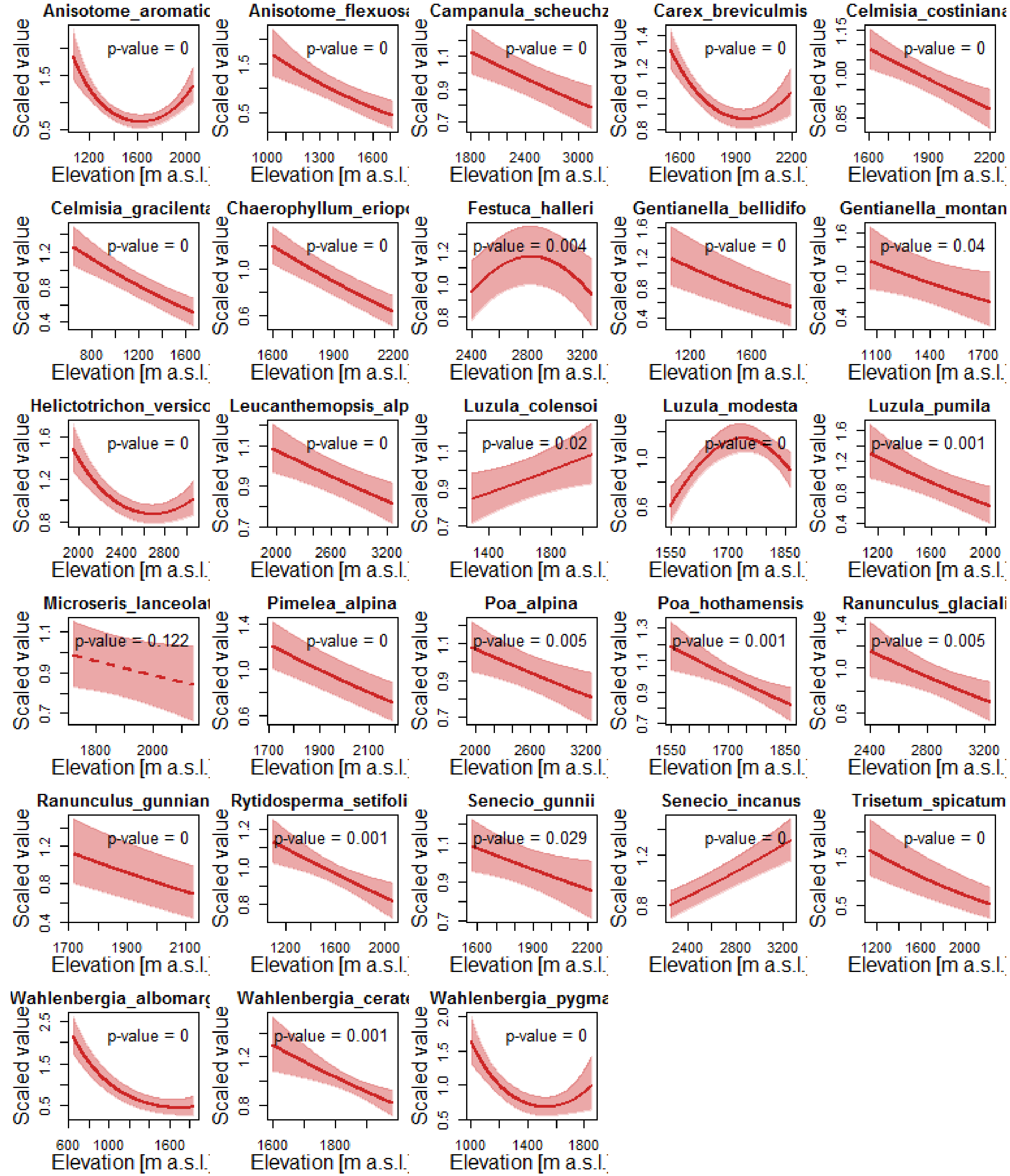
Height, LDMC and SLA across all sites along elevation



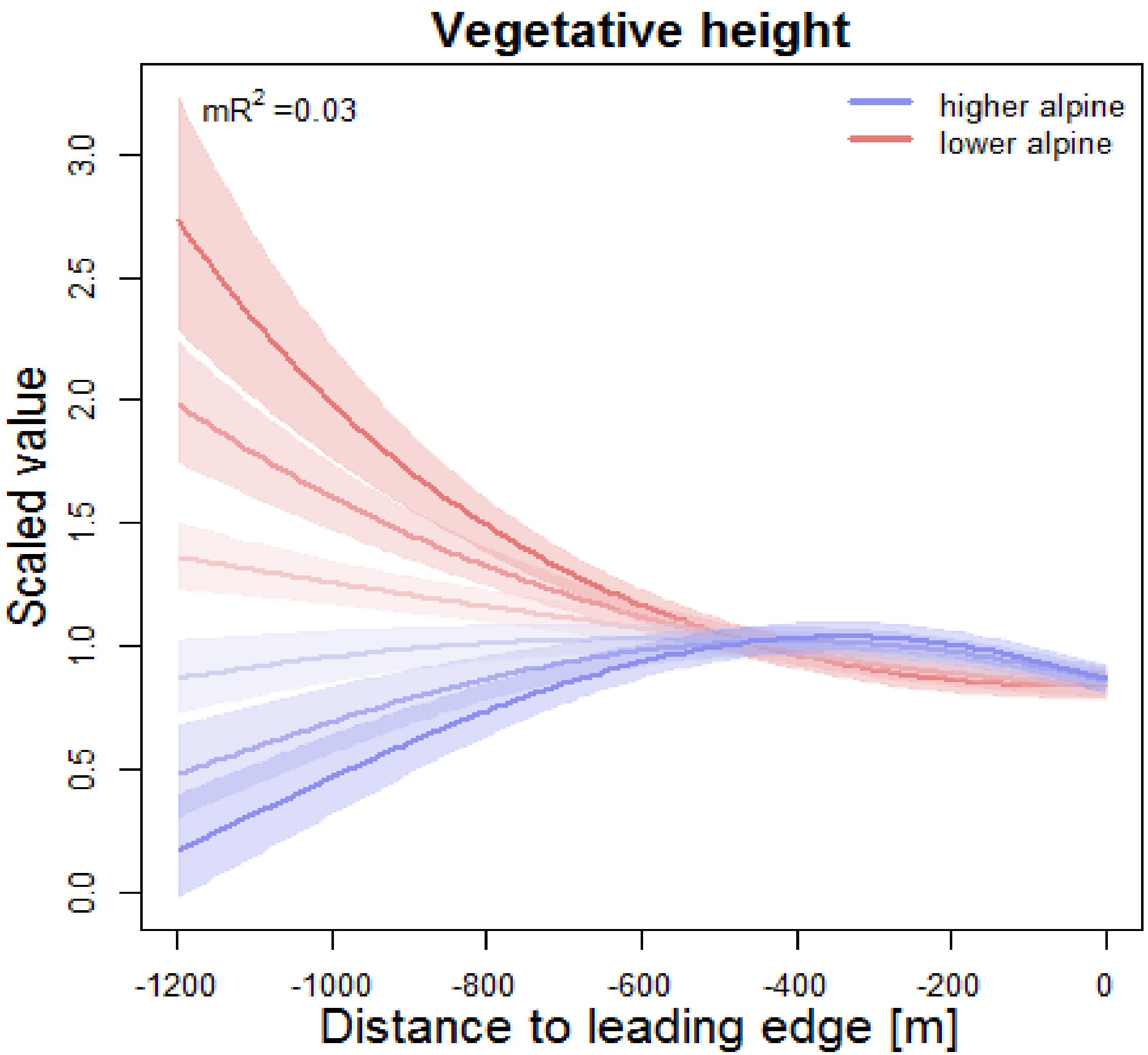
Scaled values: Individual divided by mean value of species
Transect as random factor
Back-transformed values of model fits

Vegetative height of all species

Carex breviculmis, OZ



Lower alpine plants show more height variation



Species grouped by elevation optimum

Neighbouring vegetation effects vs. elevation?

Neighbouring vegetation explains more variation than elevation

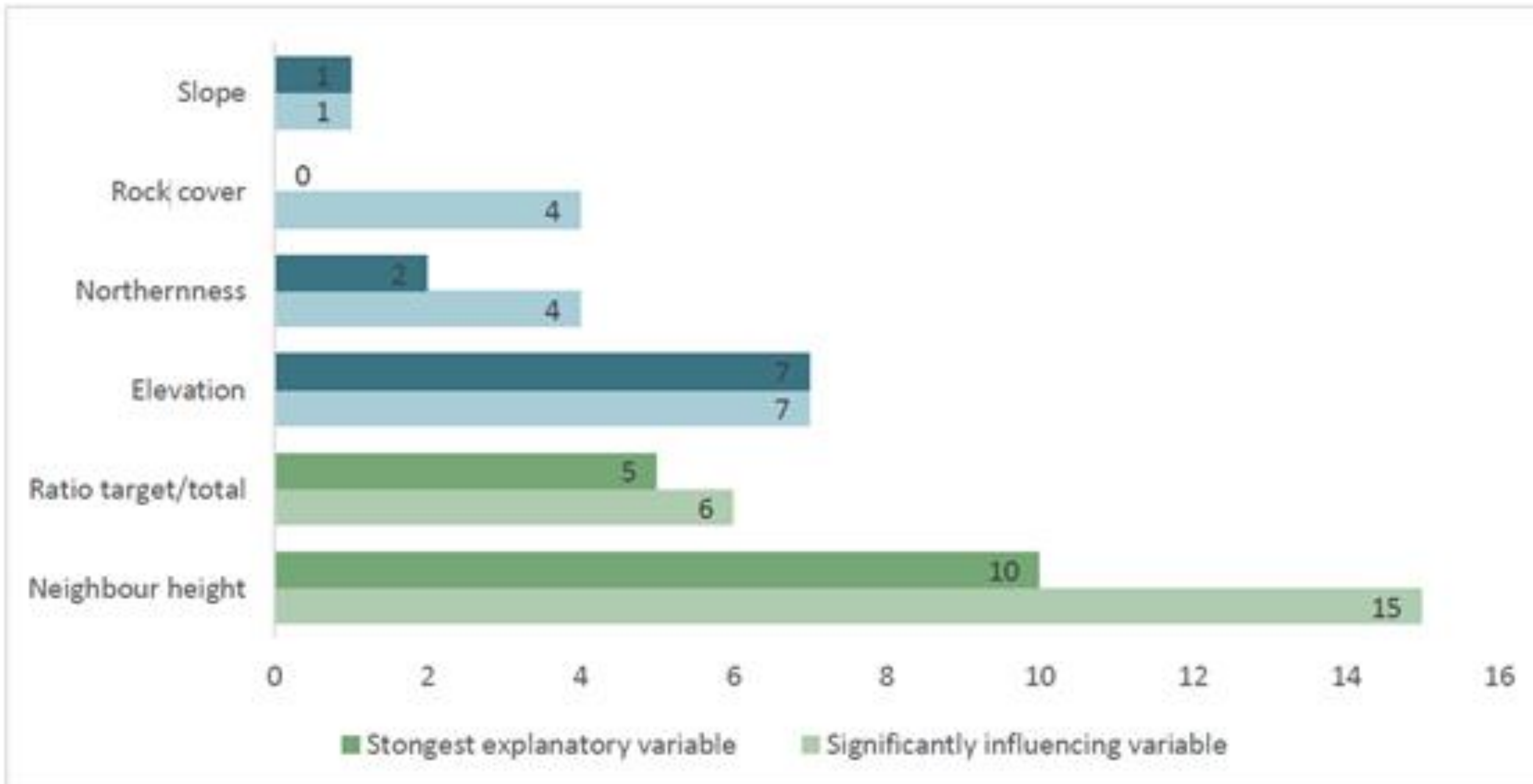
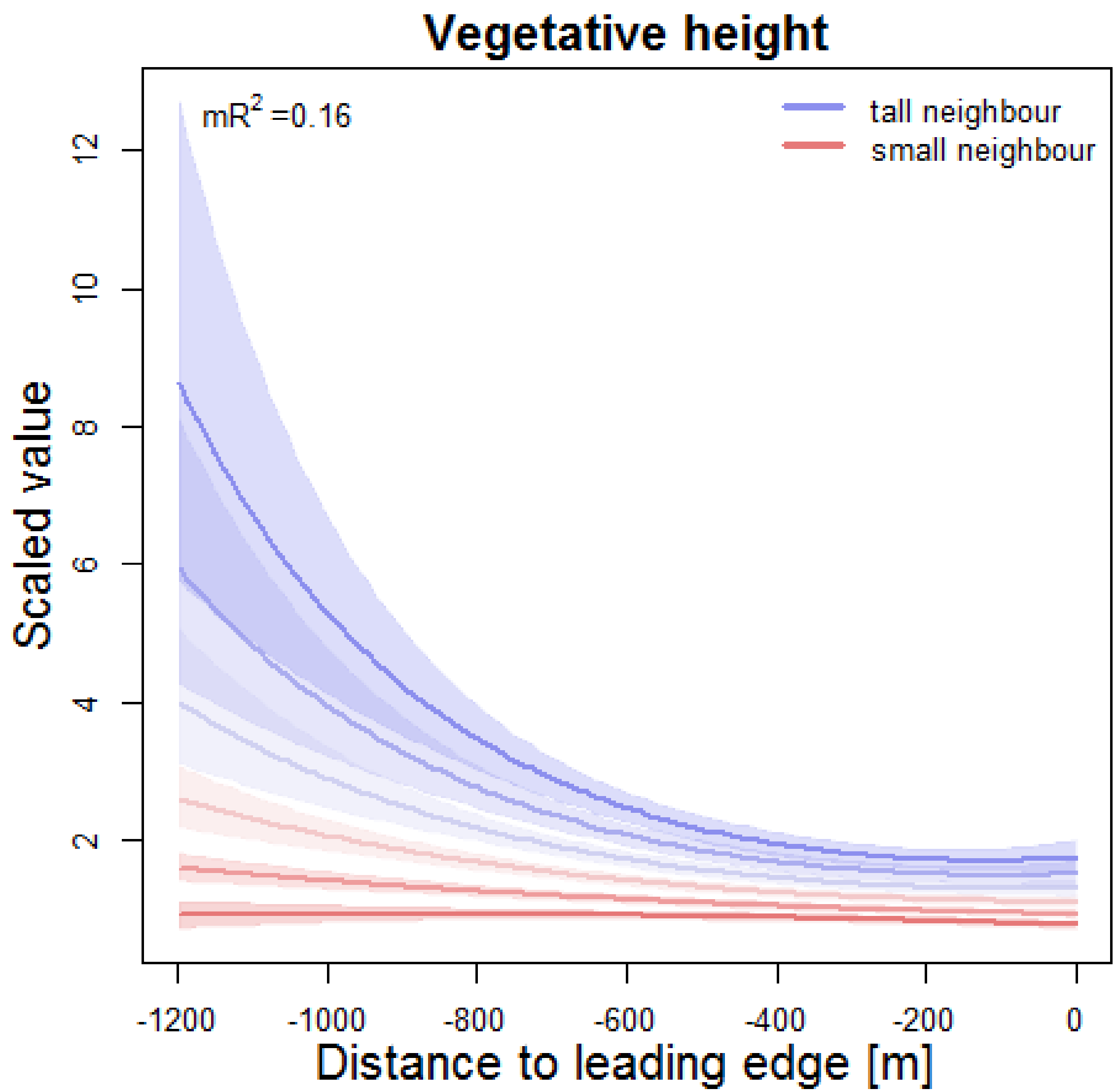


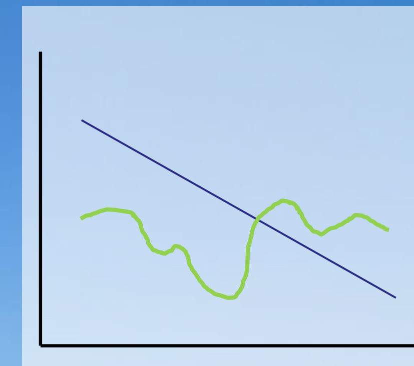
Figure 15: Site factors significantly influencing trait variation

Species with tall and small neighbours

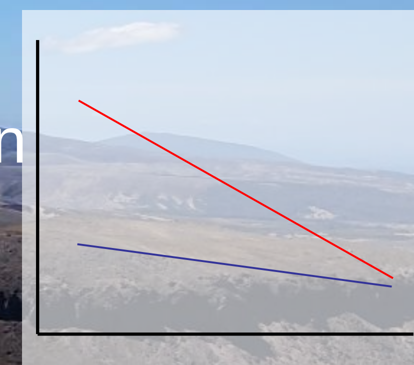


Preliminary Conclusions

Plant height shows strong trends along elevation, leaf traits show weak trends.
→ Plant height most relevant trait re. climate change?



High-alpine plants may show weaker trends in elevation than low-alpine species.
→ Greater success for low-alpine species?



Plants with high trait variability can grow among tall neighbours.
→ Higher chances to persist with climate change?

Next steps

Analysis:

Other traits: Size (not only height) of plants, LA, flowering
Population fitness (size, reproduction)
Trade-off between flowering and vegetative growth
Analyze trailing edge
Vulnerability of OZ plants
Data from China

Follow-up projects:

More species and more traits! Compare with TTT?
Protocol for more collaborators
Root traits (with Julie Deslippe)
Neighbour interactions (cushions), Master’s Thesis Annabarbara Beilstein
Genetic component: plasticity vs. phenotypic variation (Adrienne Nicotra)

Thank you