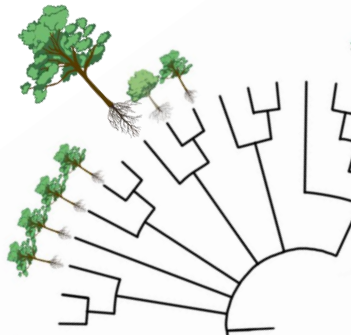
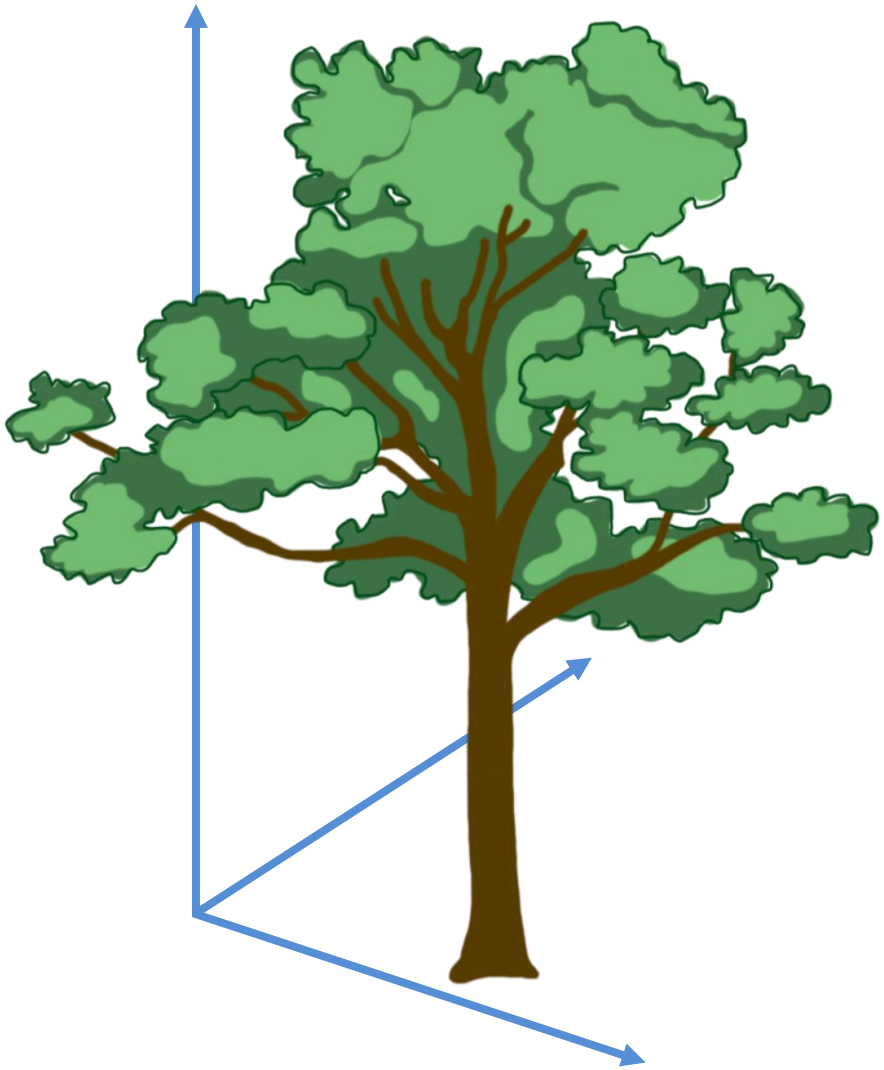
The distribution patterns of functional and phylogenetic diversity in vascular plant communities.

Georg J. A. Hähn, Francesco M. Sabatini, Gabriella Damasceno, and Helge Bruelheide

21/12/2022
12:15:00
Fintry Auditorium

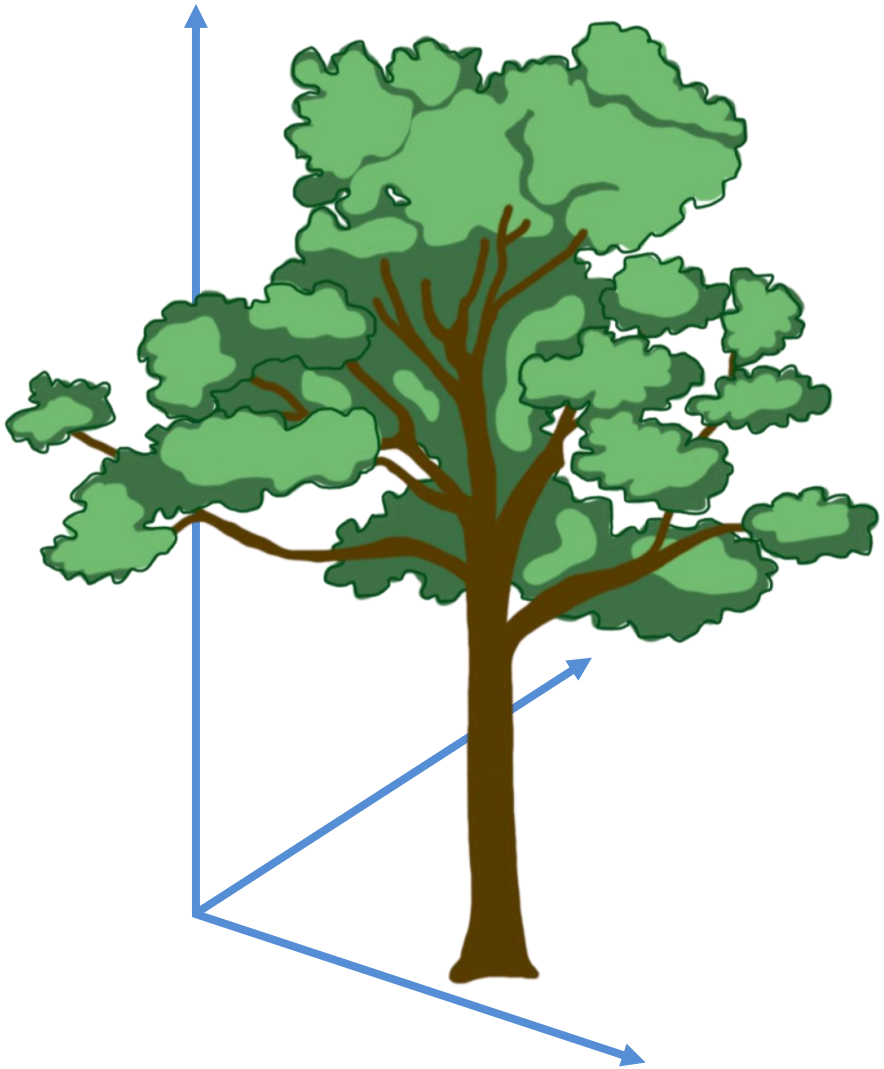


Introduction – Plant species niche



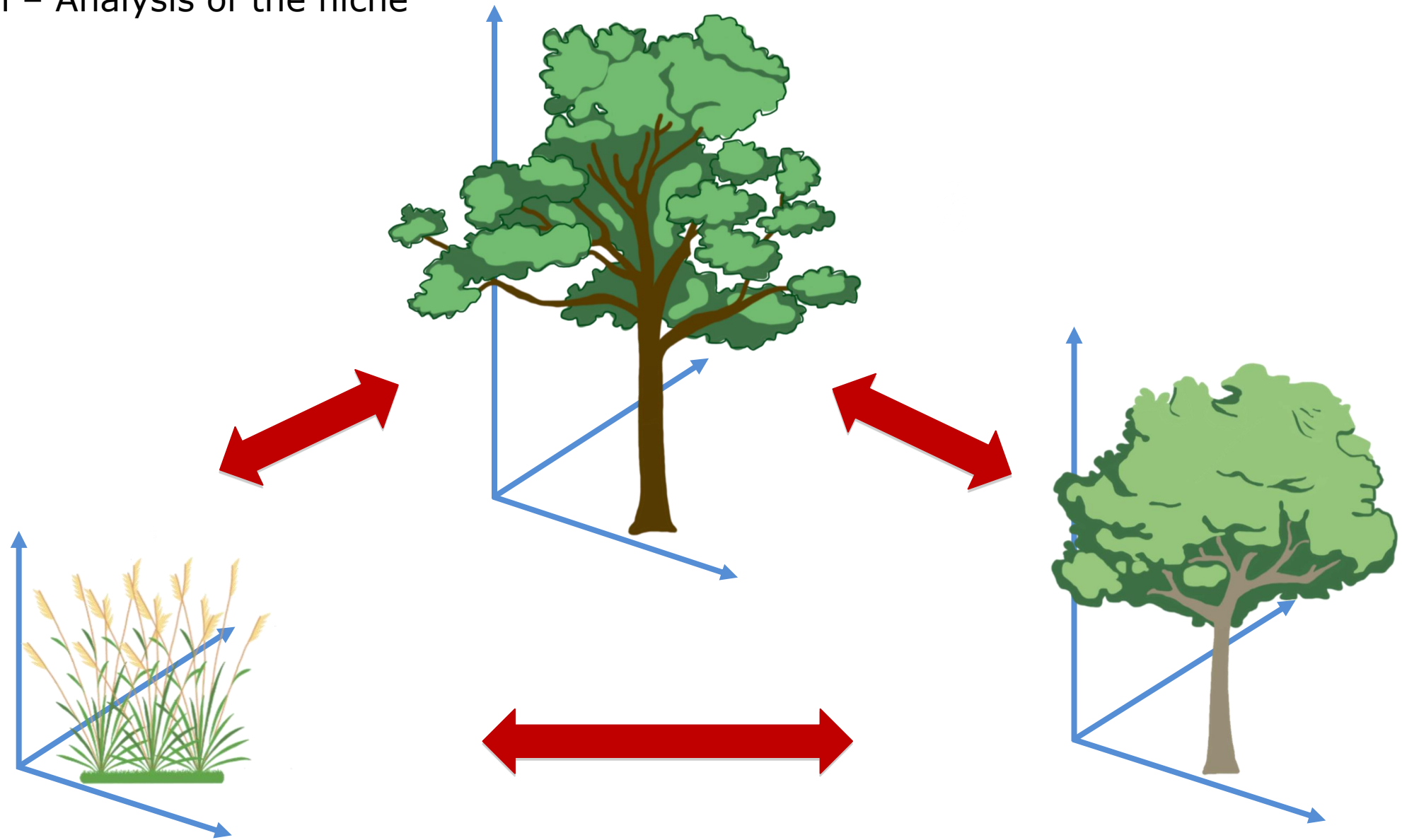
[1] Hutchinson 1978 [2] Gallego-Tévar et al. 2018

Introduction – Plant species niche in the environment



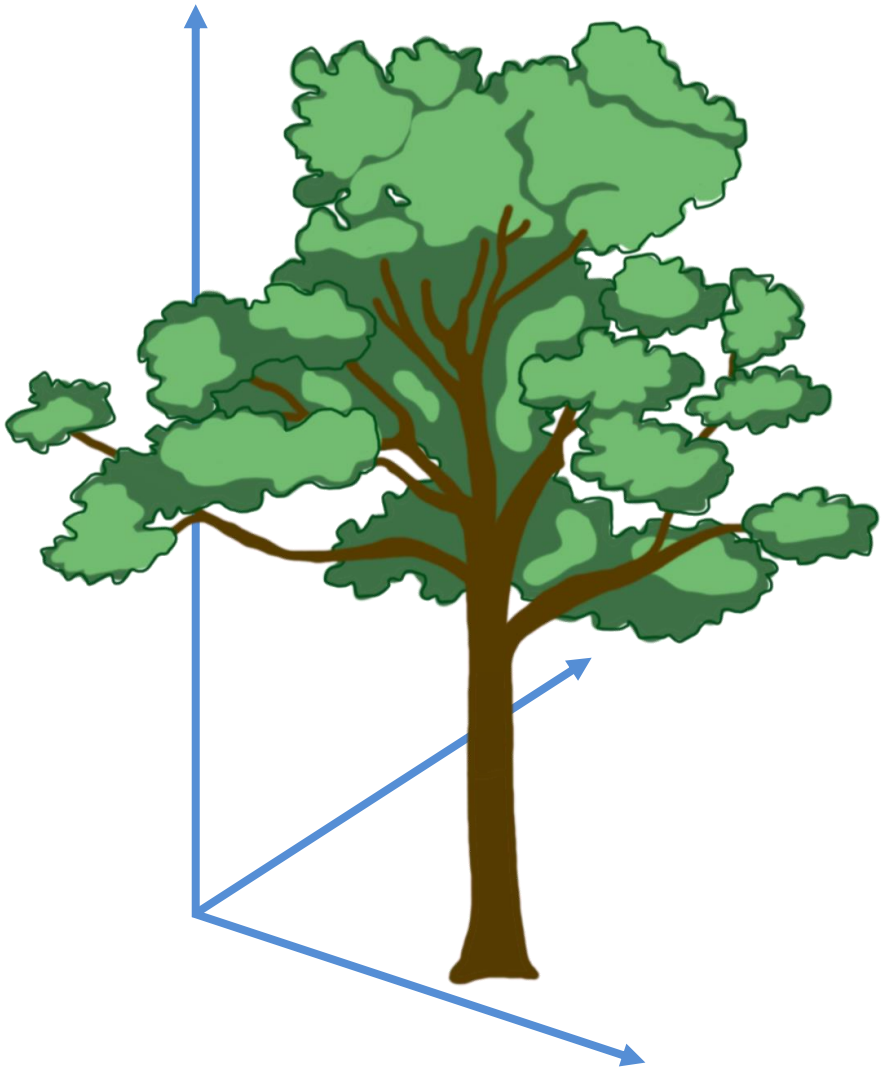
[1] Hutchinson 1978 [3] Reich et al. 2003

Introduction – Analysis of the niche



[4] McGill et al. 2006

Introduction – Analysis the niche: Traits



[4] McGill et al. 2006 [5] Wright et al. 2004

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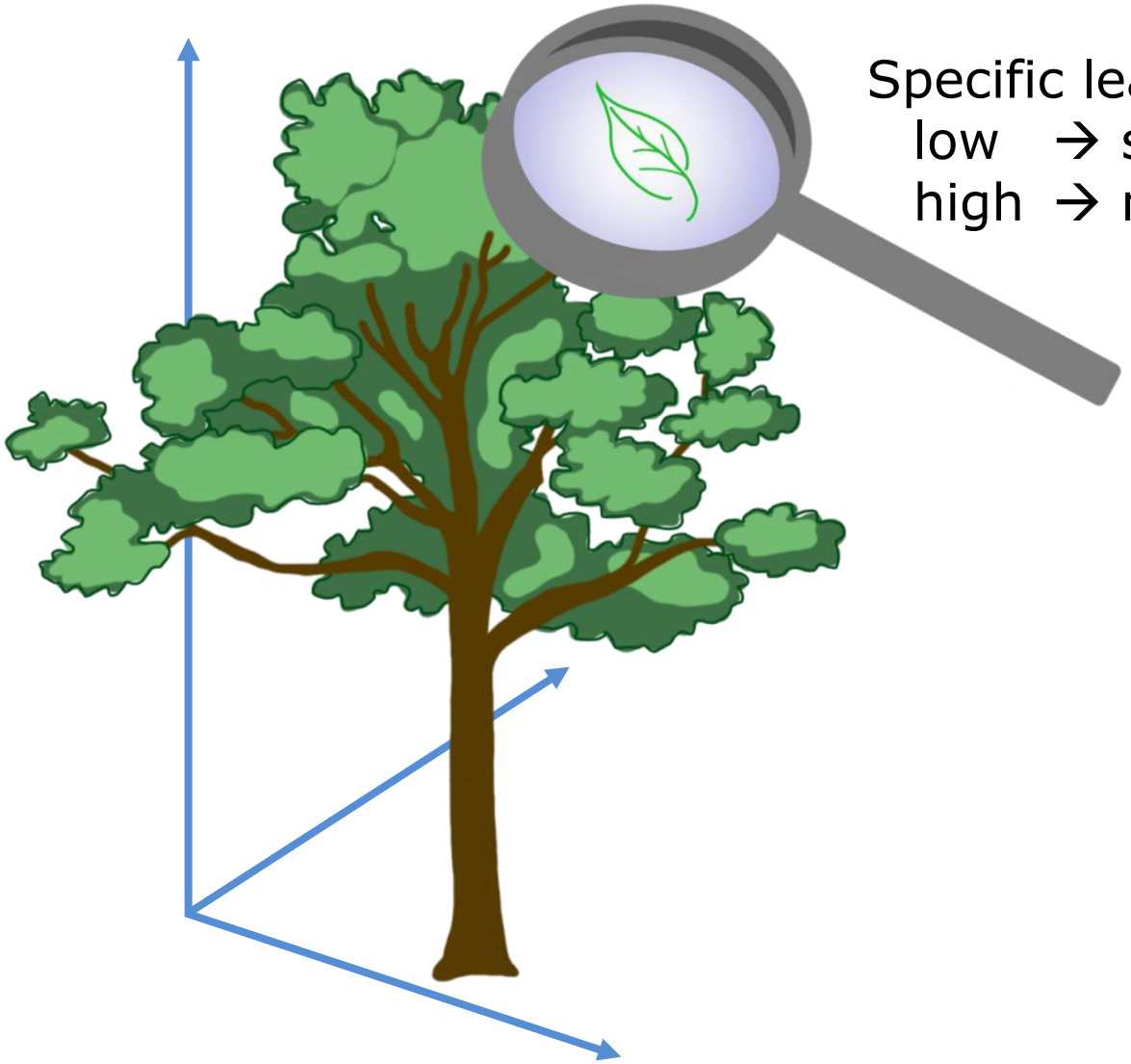

Specific leaf area (**SLA**)
- low → species tolerates stress
- high → most use of favourable conditions

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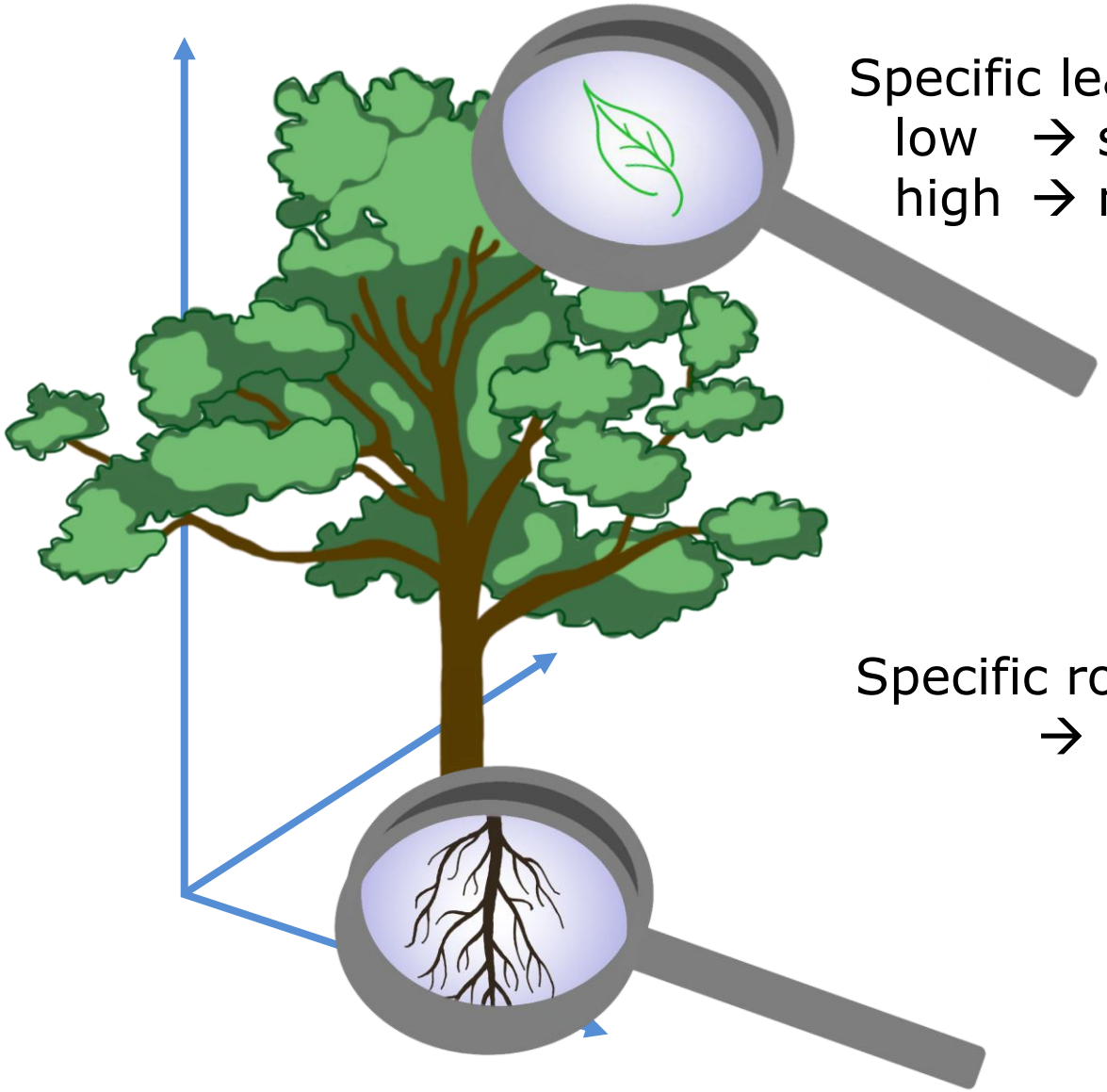
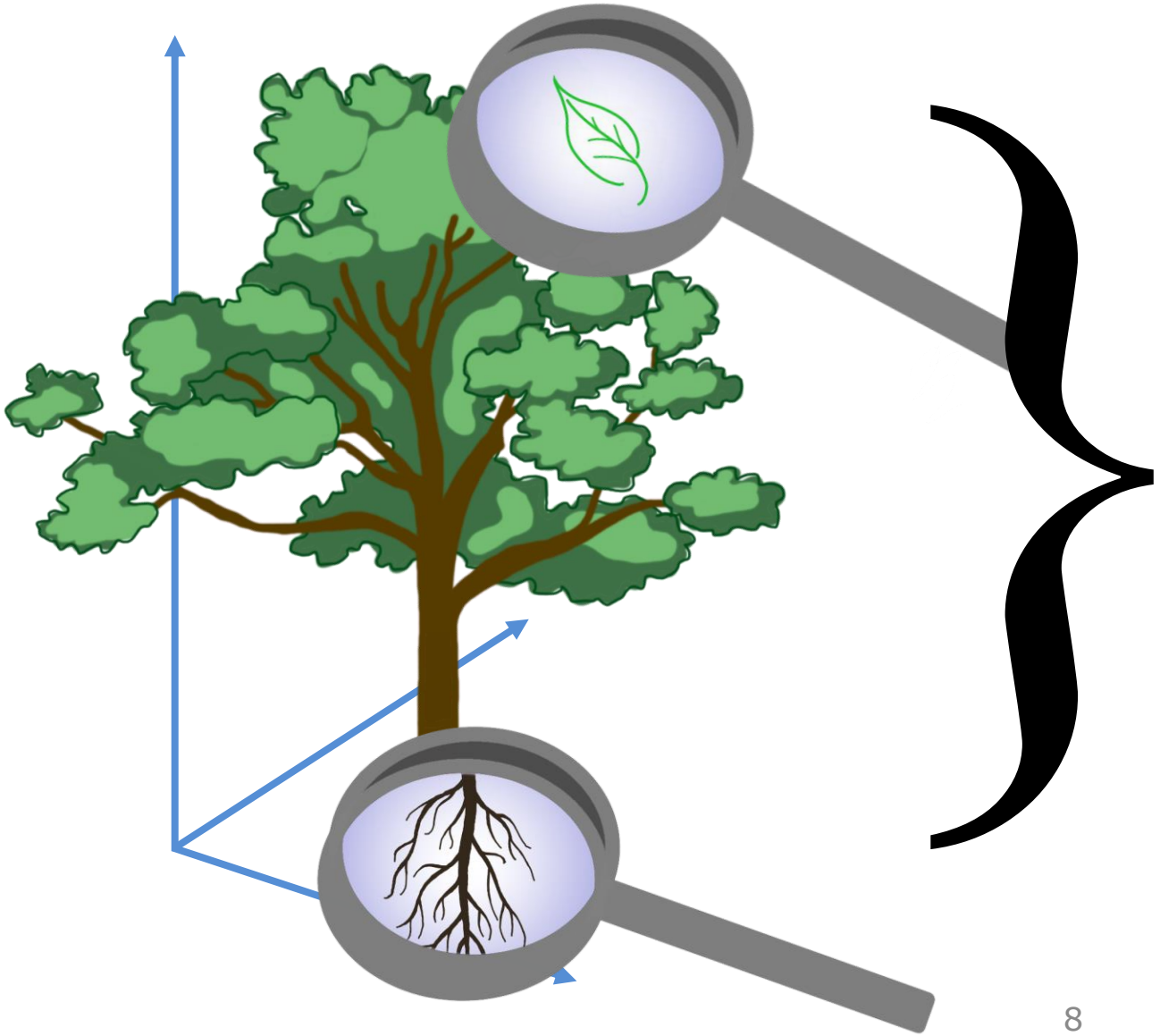


Specific leaf area (**SLA**)
low → species tolerates stress
high → most use of favourable conditions

Specific root length (**SRL**)
→ nutrient and water uptake

[4] McGill et al. 2006 [5] Wright et al. 2004

Introduction – Analysis of the niche: Phylogeny



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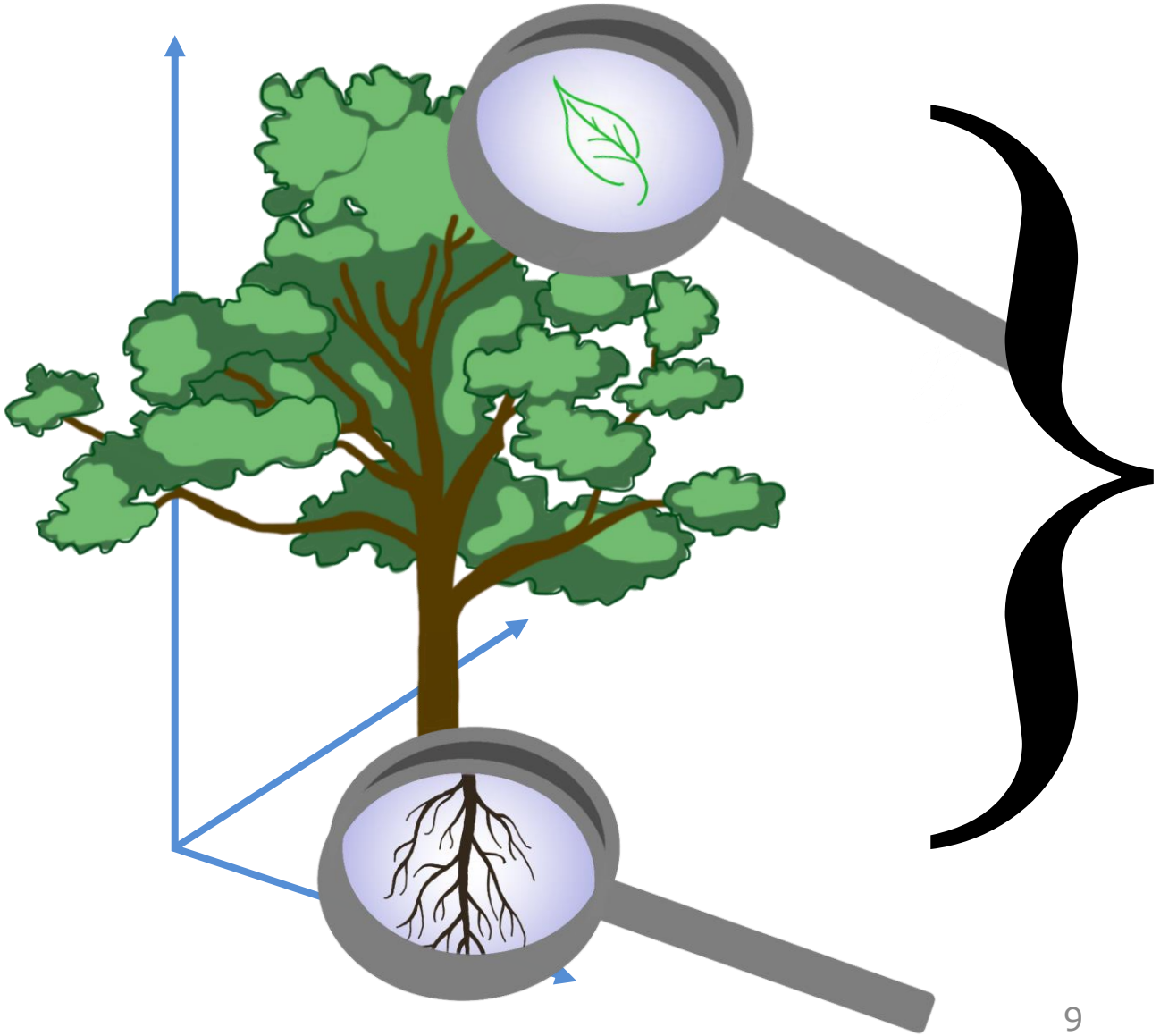

[3] Reich et al. 2003 [6] Cavender-Bares et al. 2004 [7] Ackerly 2009

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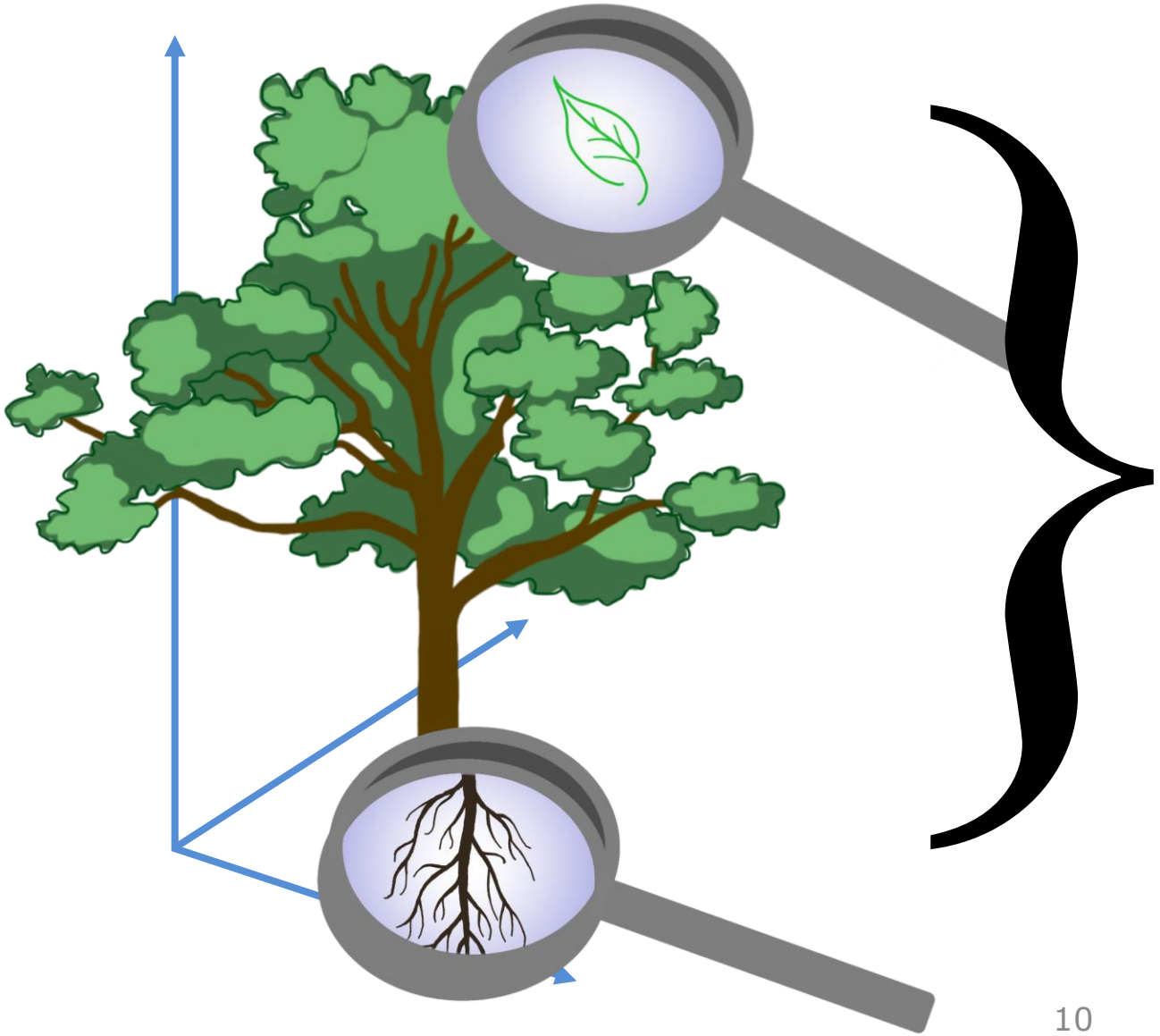

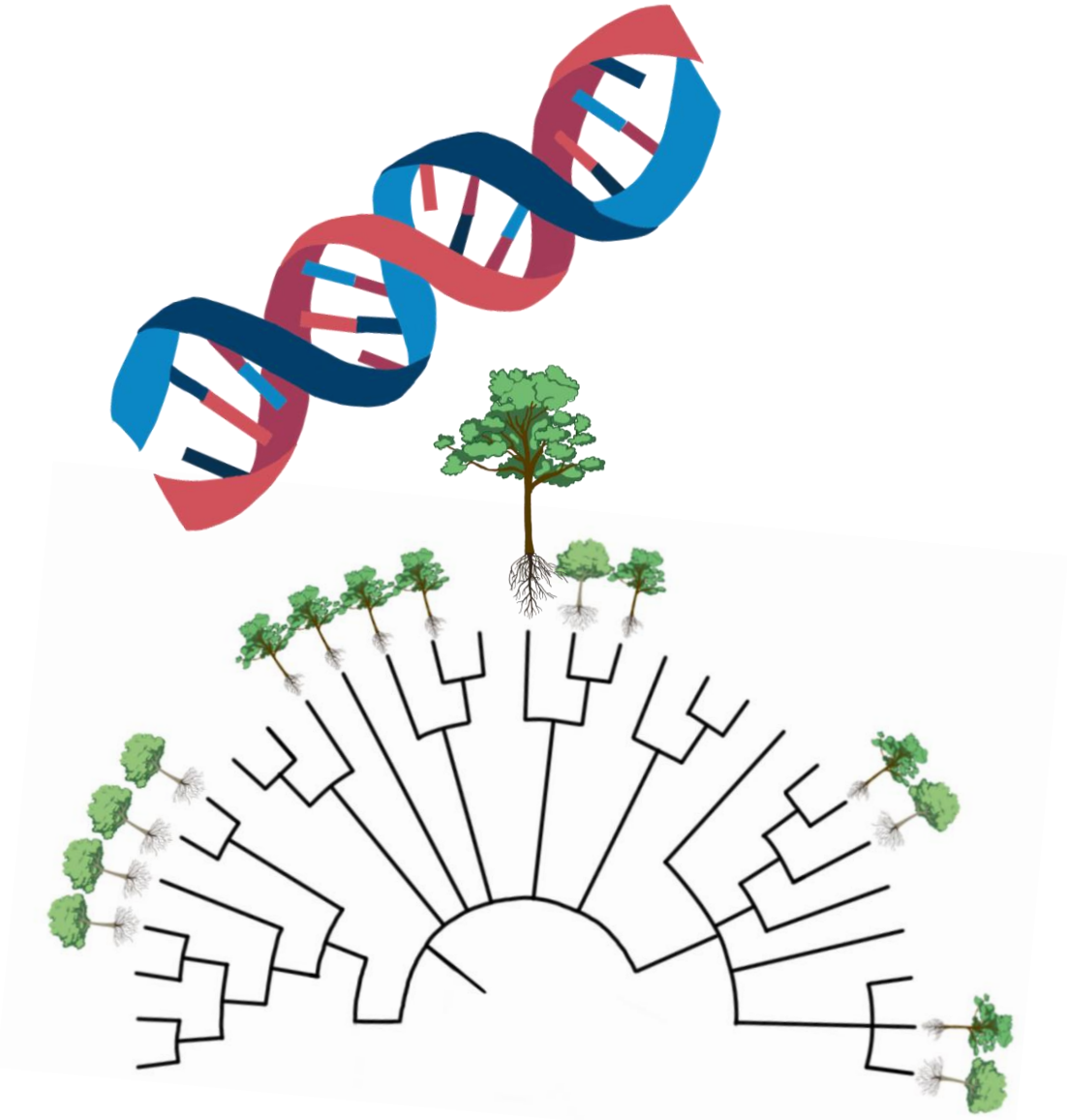

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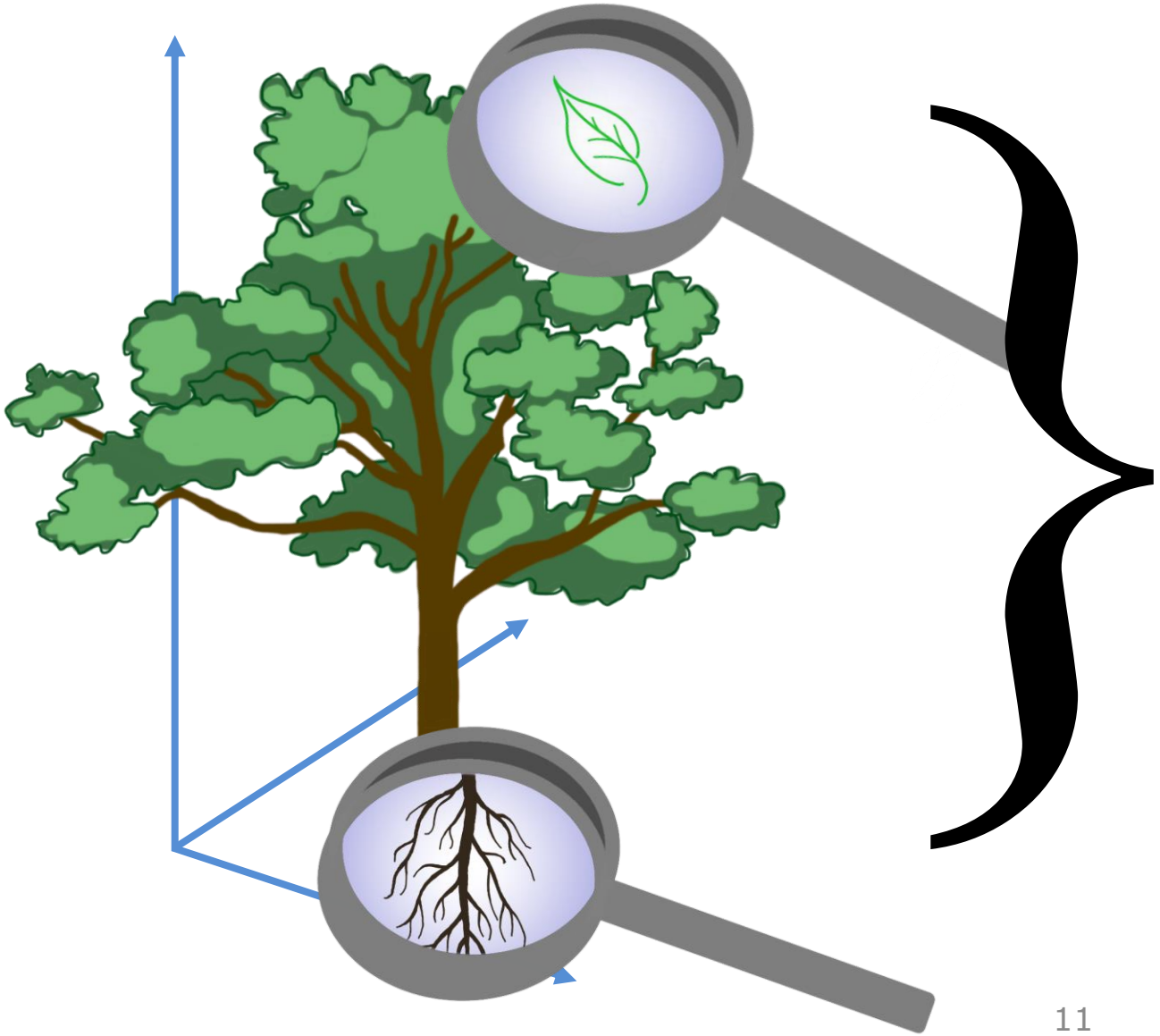

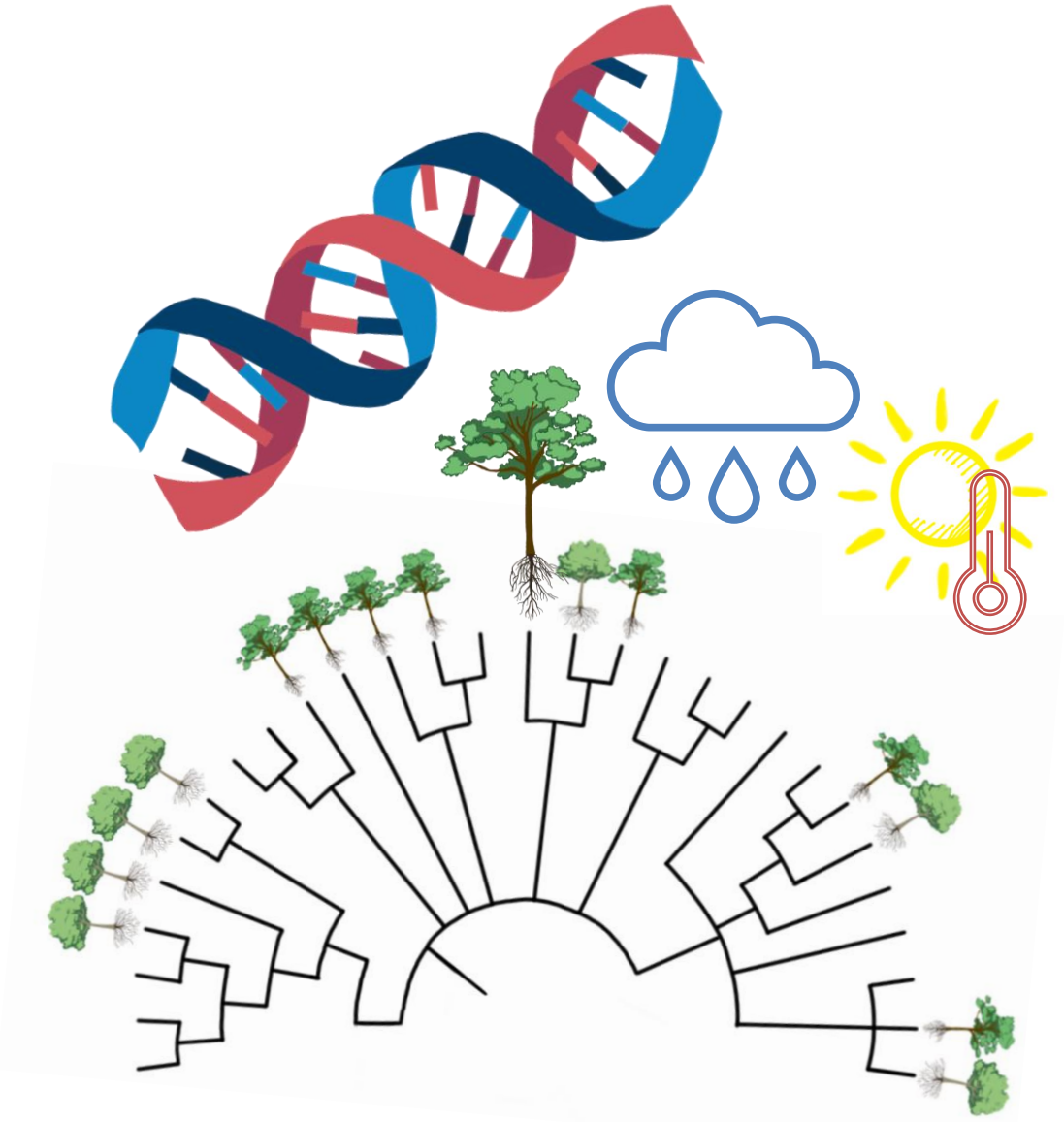

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Introduction – Research questions

1. Are functional and phylogenetic diversity correlated with each other at the global scale?

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2. To what extent is the geographical distribution of functional and phylogenetic diversity explained by present and past climate conditions?

Methods – Response and explanatory variables

sPlot

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[8] Bruelheide et al 2019

Methods – Response and explanatory variables

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Presence-absence data for
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Methods – Response and explanatory variables

Specific leaf area, plant height and specific root length from gap-filled TRY traits[9, 10, 11, 12]

TRY Plant Trait Database

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[9] Shan et al. 2012 [10] Fazayeli et al. 2014 [11] Schrodt et al. 2015 [12] Kattge et al. 2020

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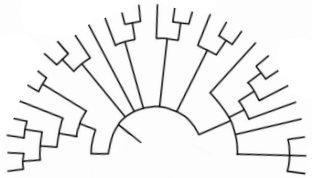

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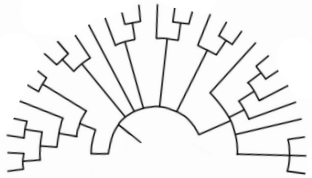

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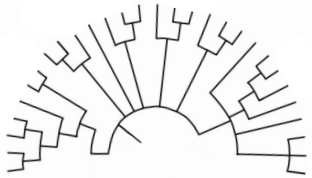

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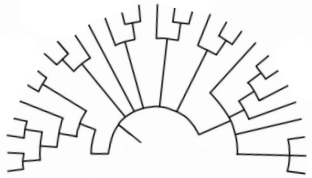

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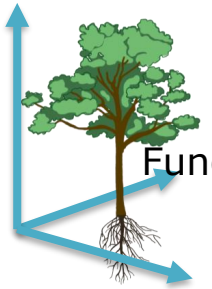
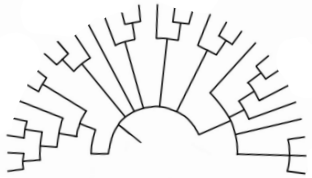


Functional diversity:
Rao`s Quadratic Entropy[15]

[15] Rao 1982

Methods – Response and explanatory variables



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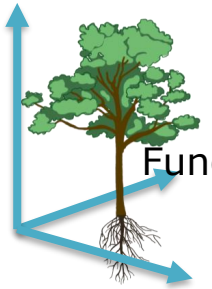

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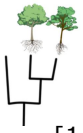

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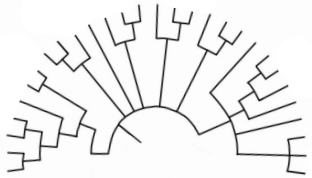

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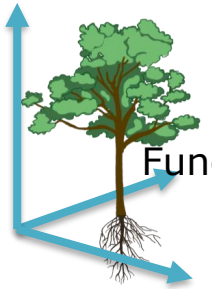

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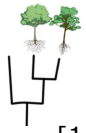

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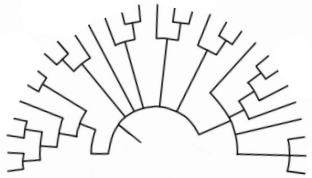

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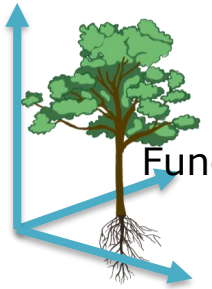

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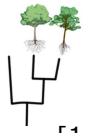

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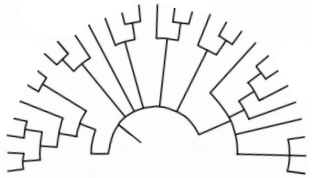
Methods – Response and explanatory variables



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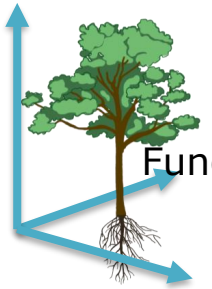

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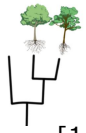

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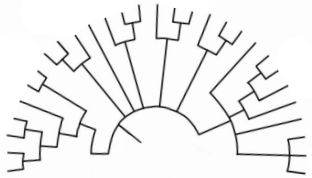
Methods – Response and explanatory variables

Predictors



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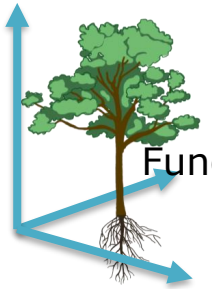

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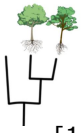

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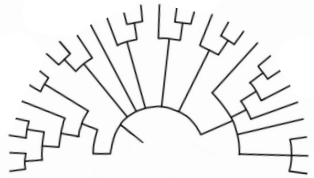
[8] Bruelheide et al. 2019

Methods – Response and explanatory variables

Predictors



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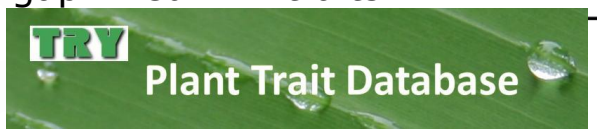

sPlot

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CHELSA

19 bioclimatic variables from CHELSA v.2.1[16, 17]

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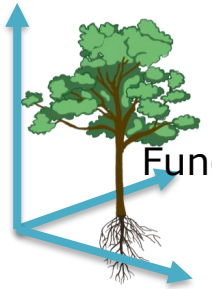

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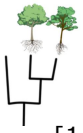

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[16] Karger et al. 2017 [17] Karger et al. 2018

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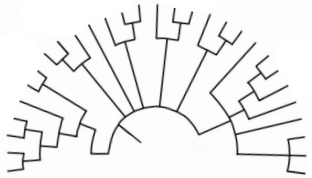

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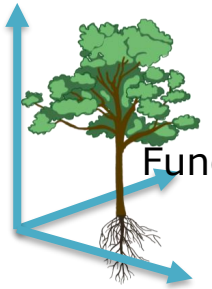

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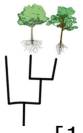

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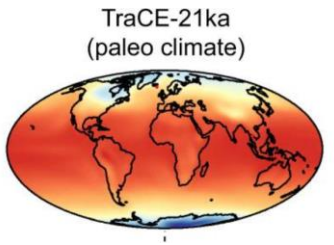
sPlot a project of iDiv

19 bioclimatic variables from CHELSA v.2.1[16, 17]



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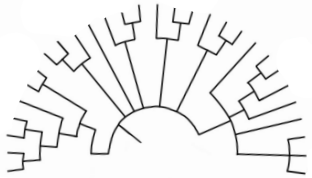
[18] Brown et al. 2020

Methods – Response and explanatory variables



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TRY Plant Trait Database

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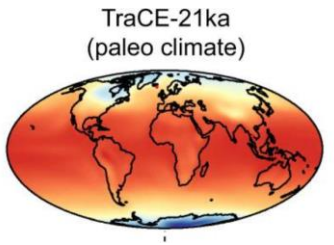

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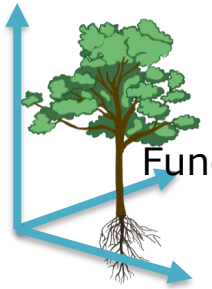

Functional diversity:
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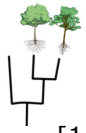

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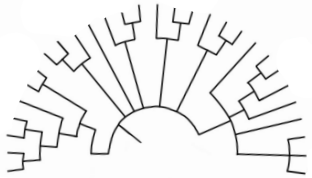

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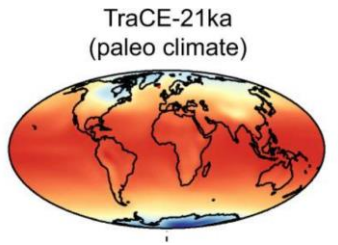

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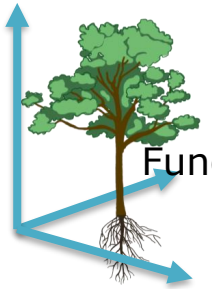

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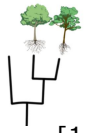

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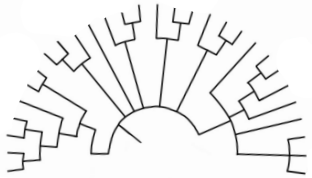

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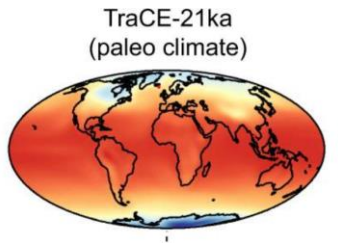

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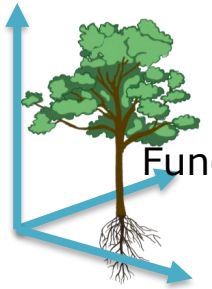

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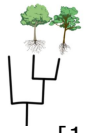

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[18] Brown et al. 2020

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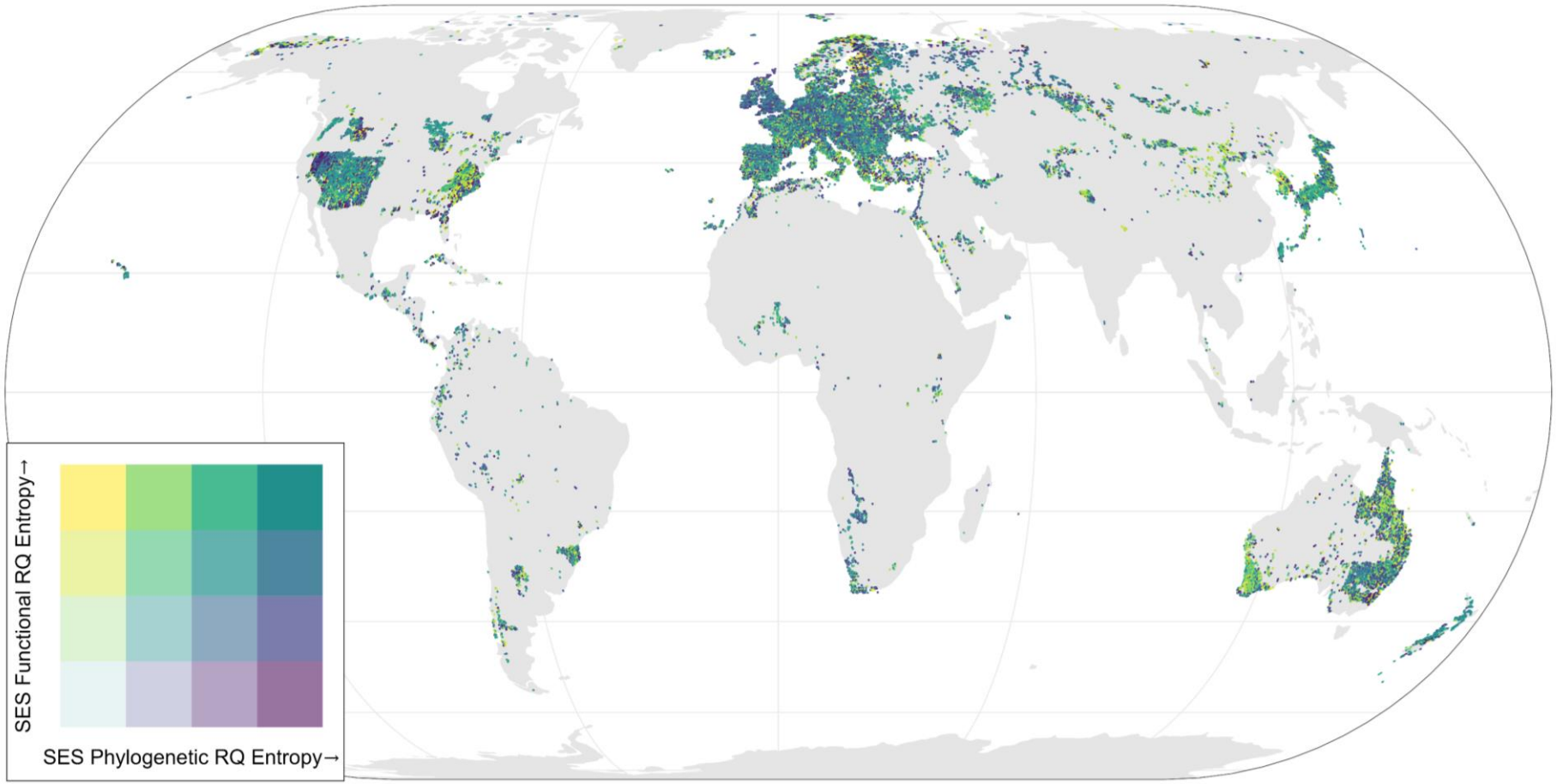

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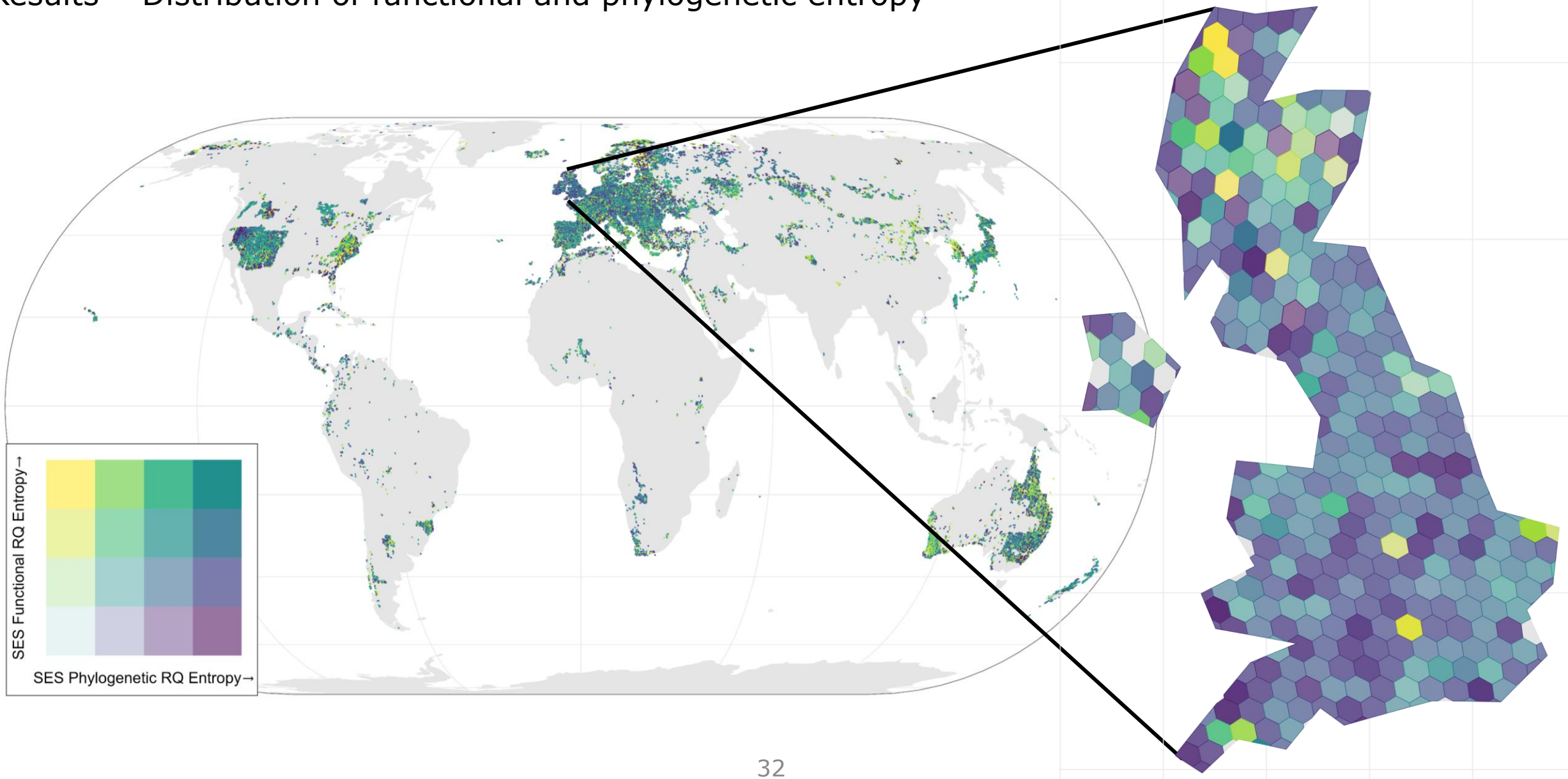

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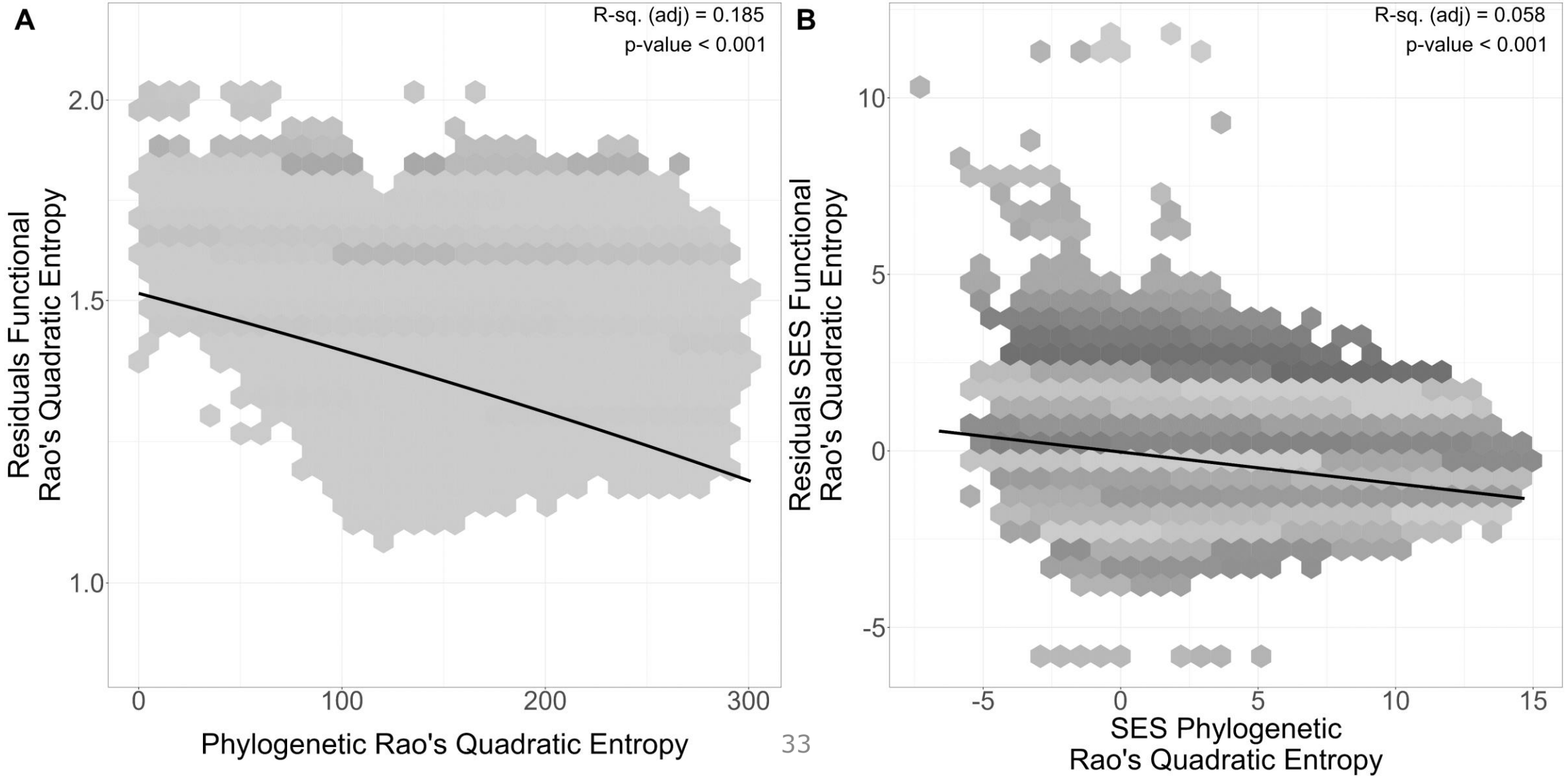

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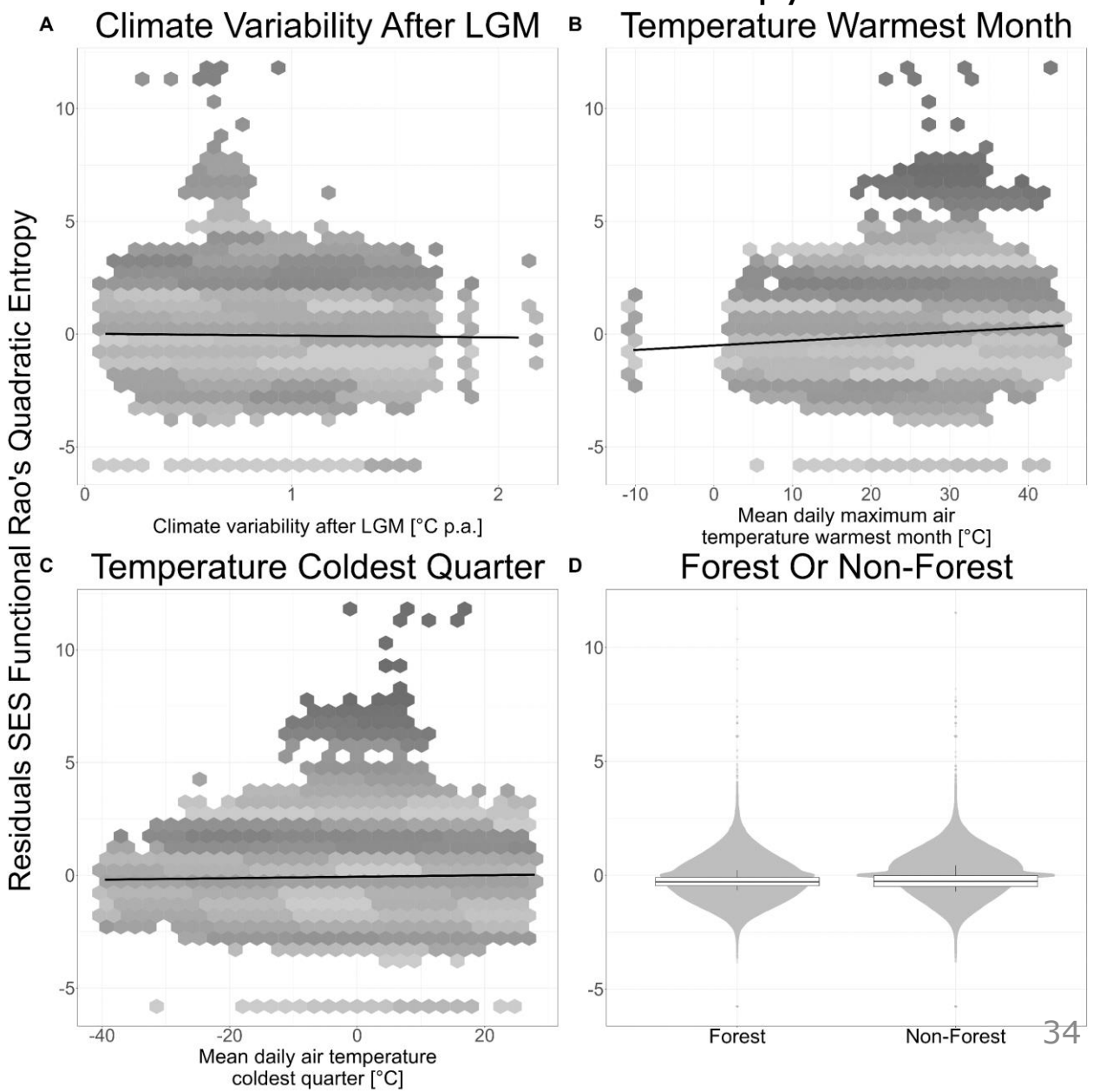

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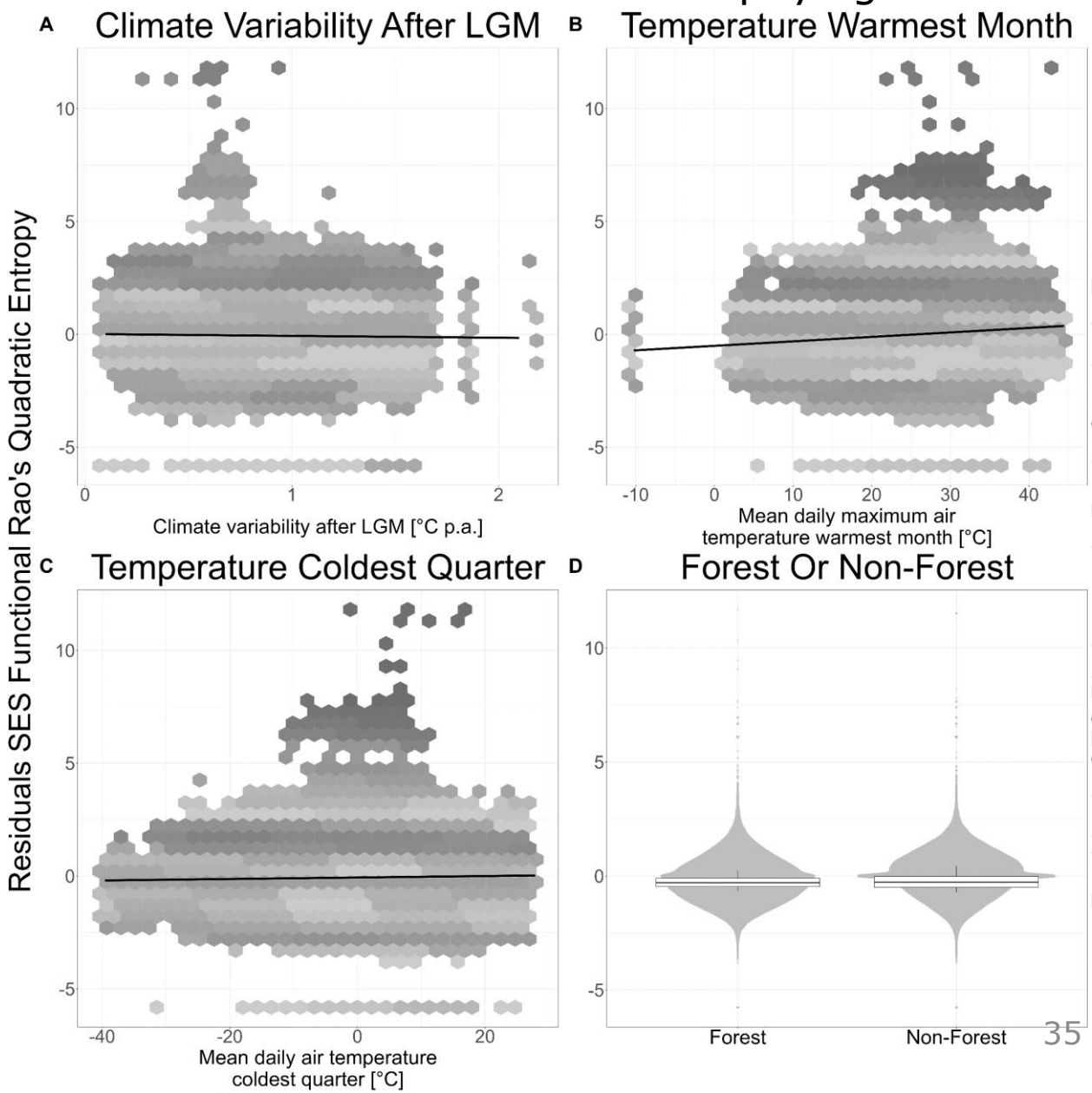

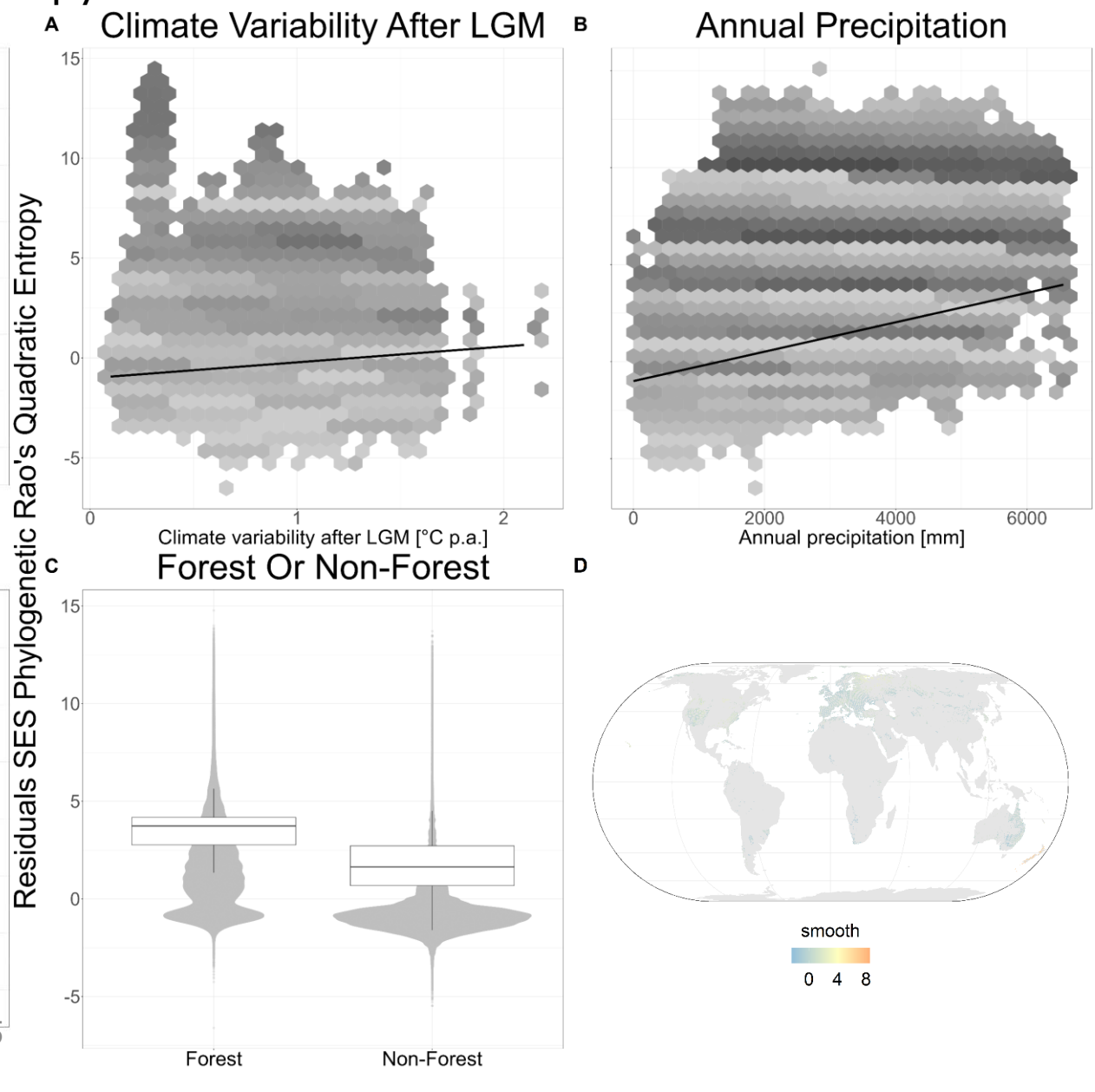

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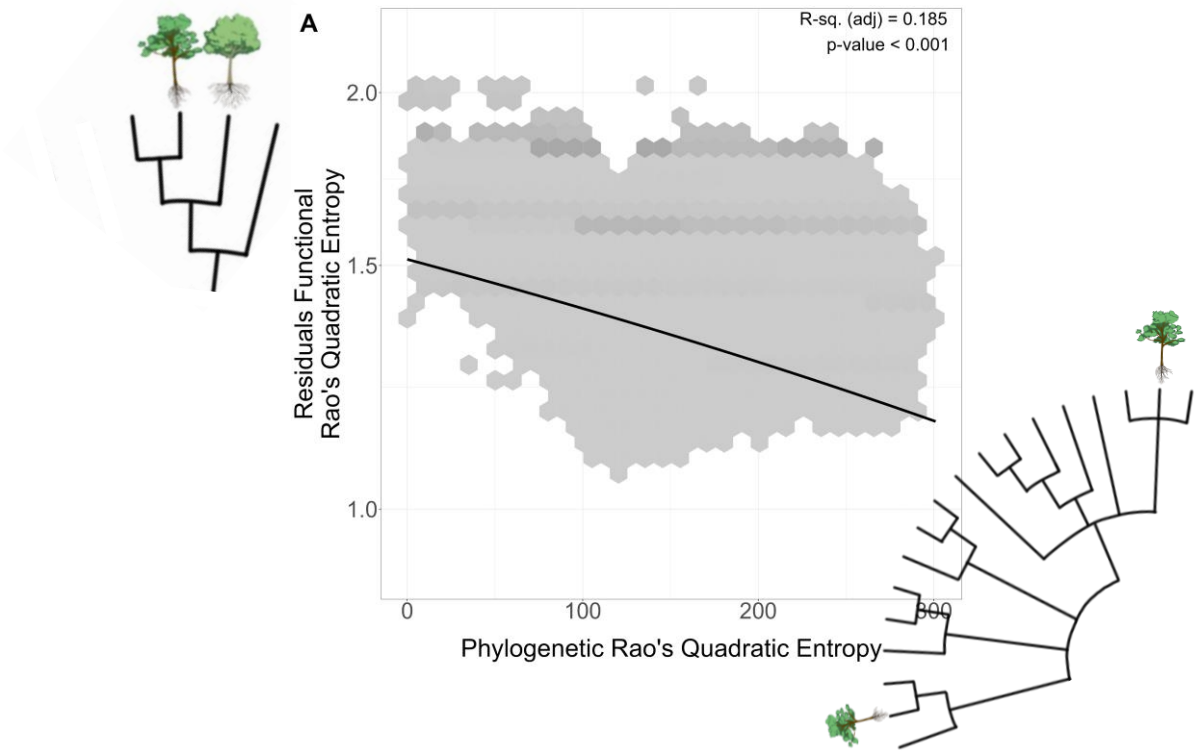

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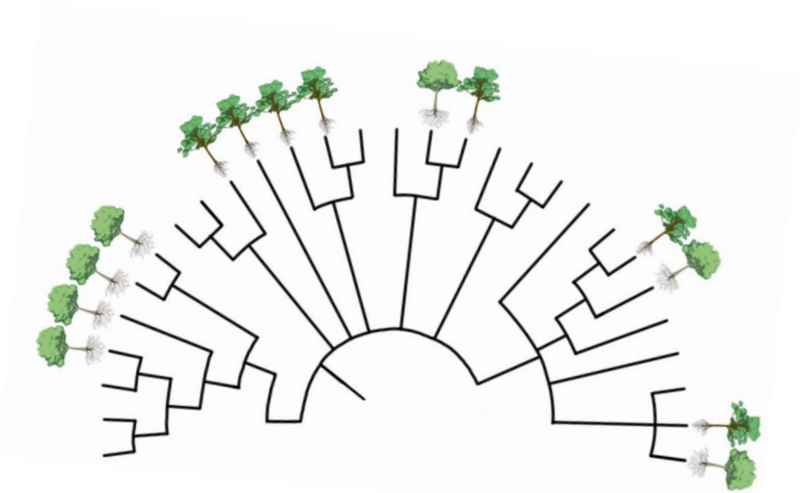
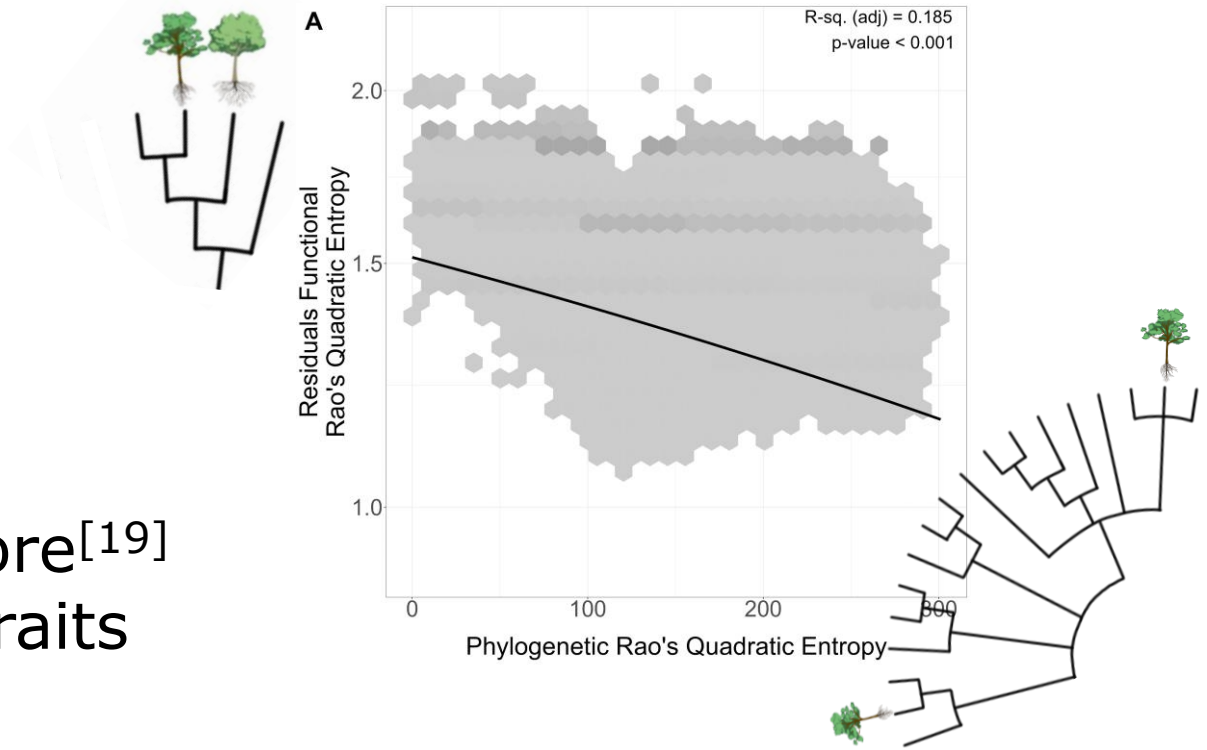




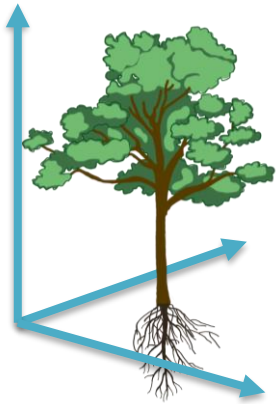
Positive correlation was shown before[19]
Increasing with higher number of traits

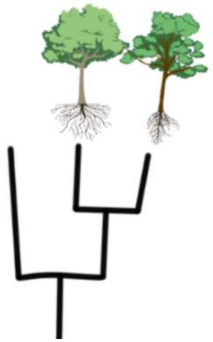
Traits map differently on the phylogeny at smaller spatial extent[6, 7]

[19] Tucker et al. 2018 [6] Cavender-Bares et al. 2004 [7] Ackerly 2009

Discussion – To what extent is the geographical distribution of functional and phylogenetic diversity explained by present and past climate conditions?

Distribution pattern of functional diversity depends on current climatic conditions.





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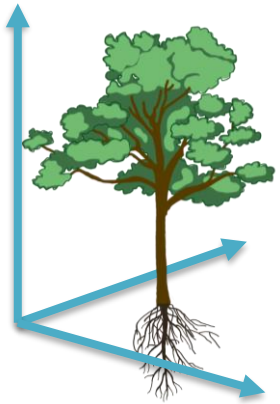
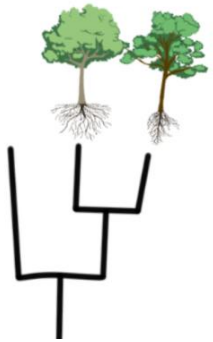


Distribution pattern of functional diversity depends on current climatic conditions.

Functional diversity can be linked to recent climate conditions on smaller spatial extent [20]

But local communities depend on local factors such as land-use[21] or soil properties[22]



[20] Del Toro et al. 2015 [21] Flynn et al. 2009 [22] Pauw et al. 2021

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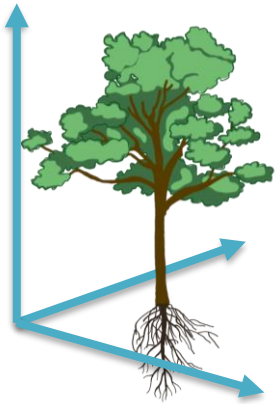

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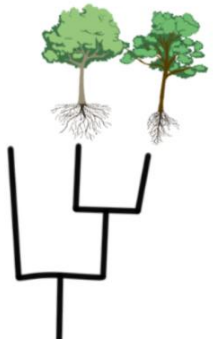
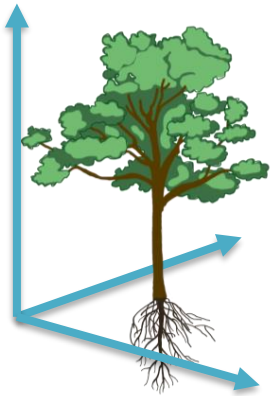


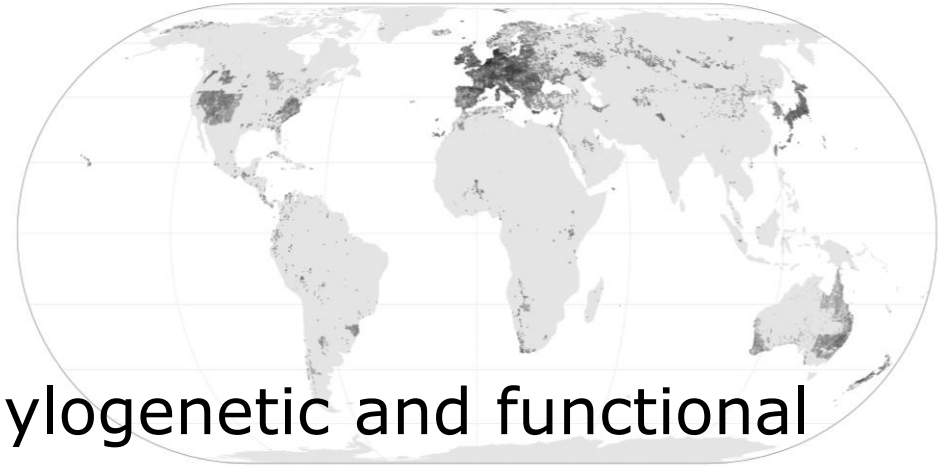
Spatial pattern of phylogenetic diversity depends on past climatic events,
→ positive correlation with climatic variability after LGM in the GAM

Phylogenetic turnovers in regions with high climatic changes after the LGM[23]

[23] Cubino et al. 2021

Outlook – Why do we care?



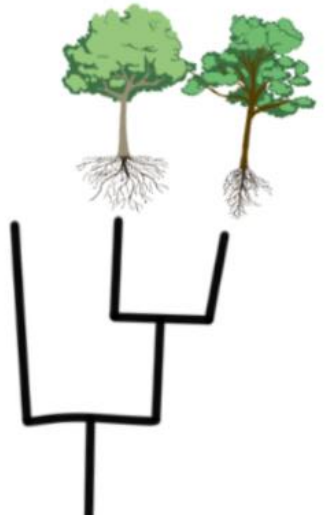


The results can be used to identify phylogenetic and functional diverse hotspots

But more information is needed in some regions, e.g., global south.

Feel free to contact us!

Please help us spread the call!



Many thanks to you,

the sPlot consortium and data contributors,

and our supporters and partners

sPlot

a project of iDiv

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