



气候和菌根类型对树种多样性-森林碳储量关系的影响

**Climate and mycorrhizae mediate the relationship of tree species
diversity and carbon stocks in subtropical forests**

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中科院植物研究所博士后

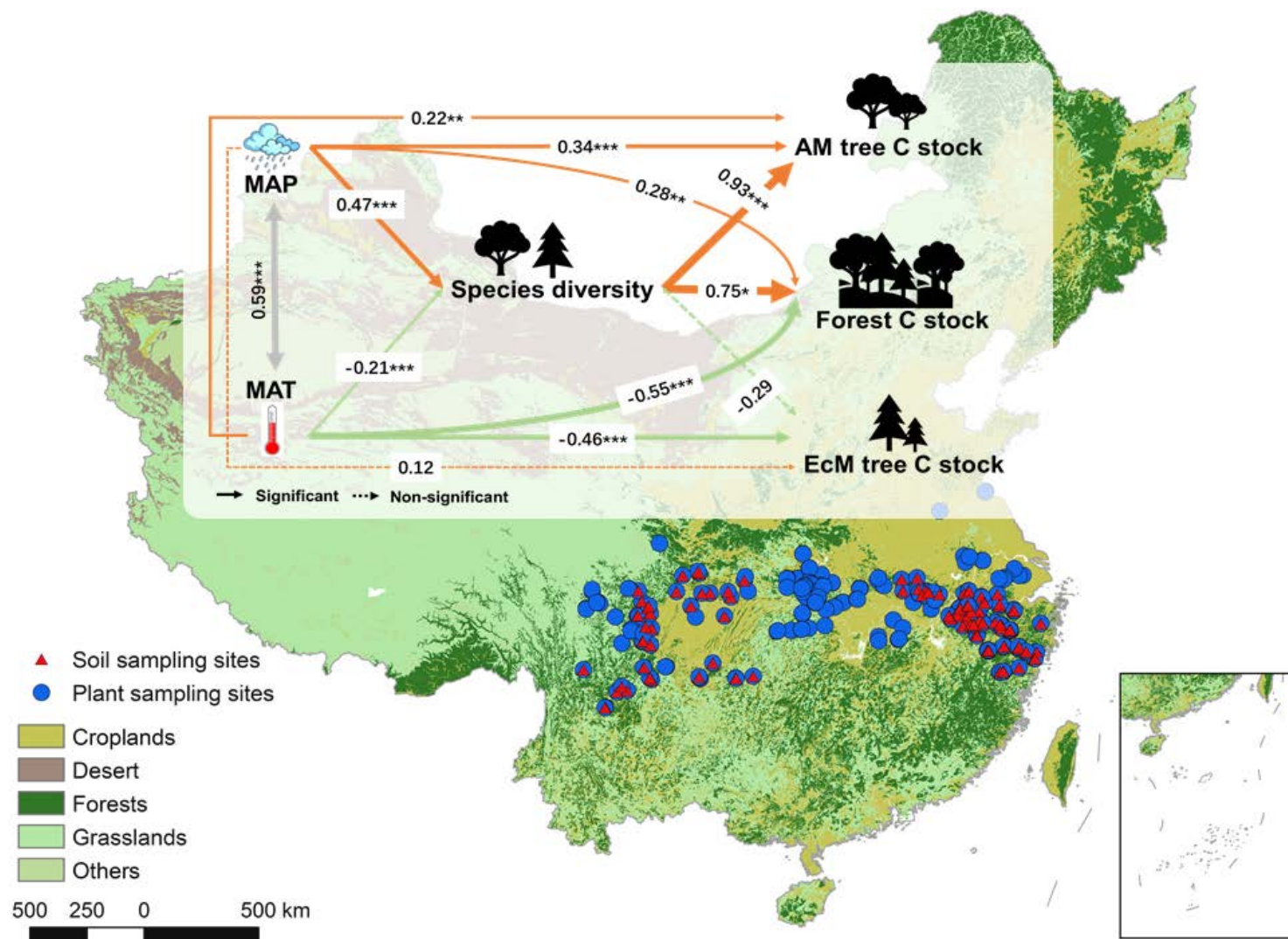
曲阜师范大学 青年副教授

1、背景介绍

2、科学问题

3、研究内容和方法

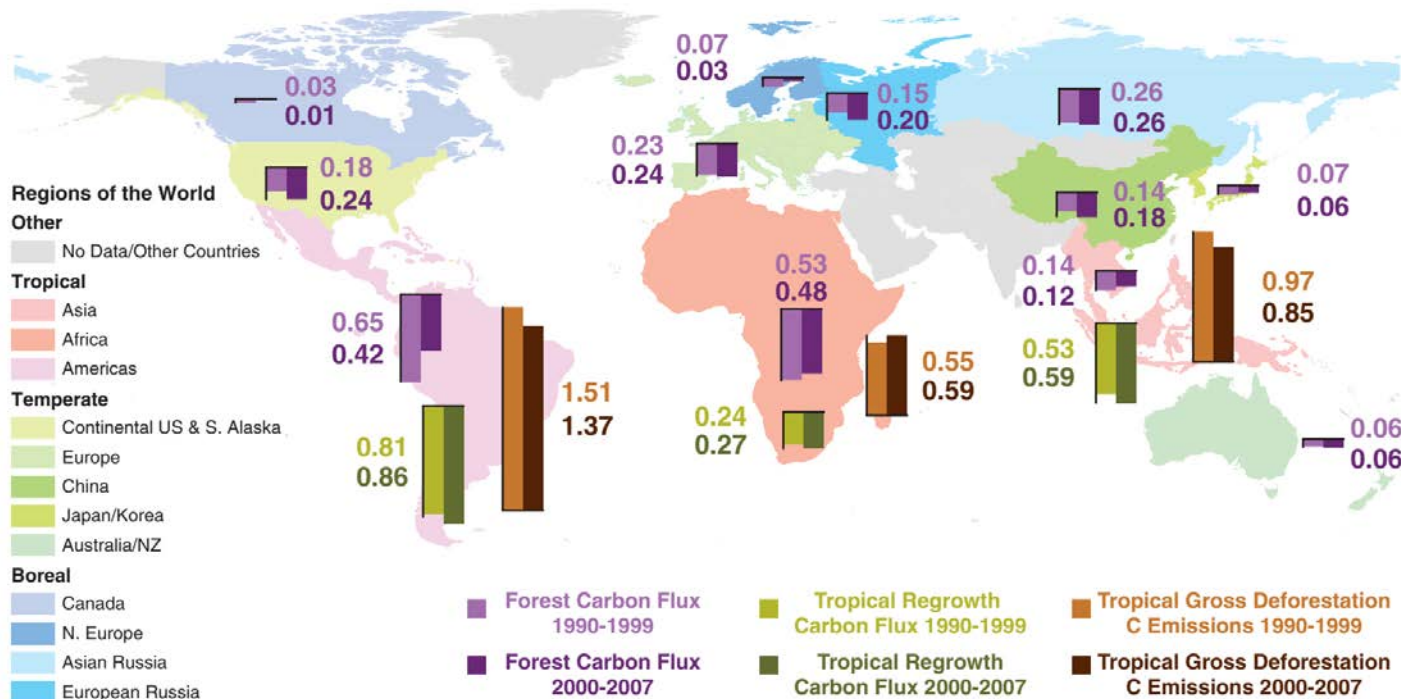
4、主要结果



研究背景1

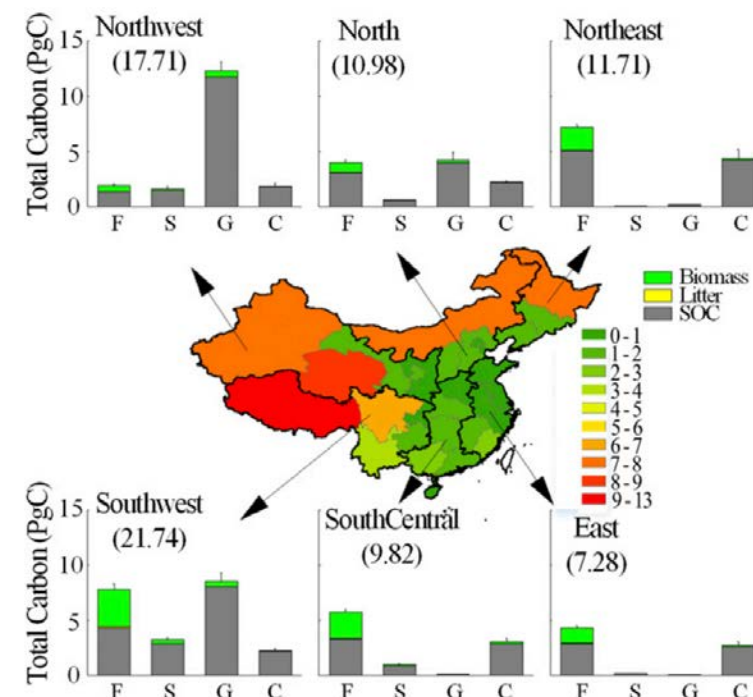


Approximately 45% of terrestrial carbon



Pan et al., (2011). *Science*, 333(6045), 988-993.

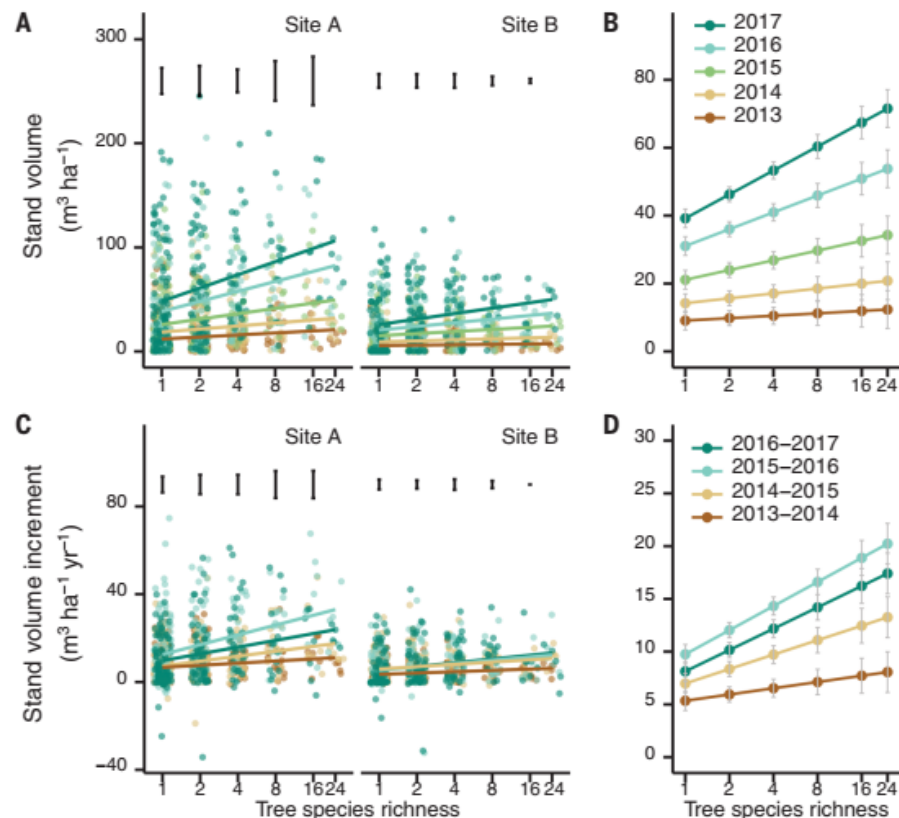
Approximately 35% of terrestrial carbon



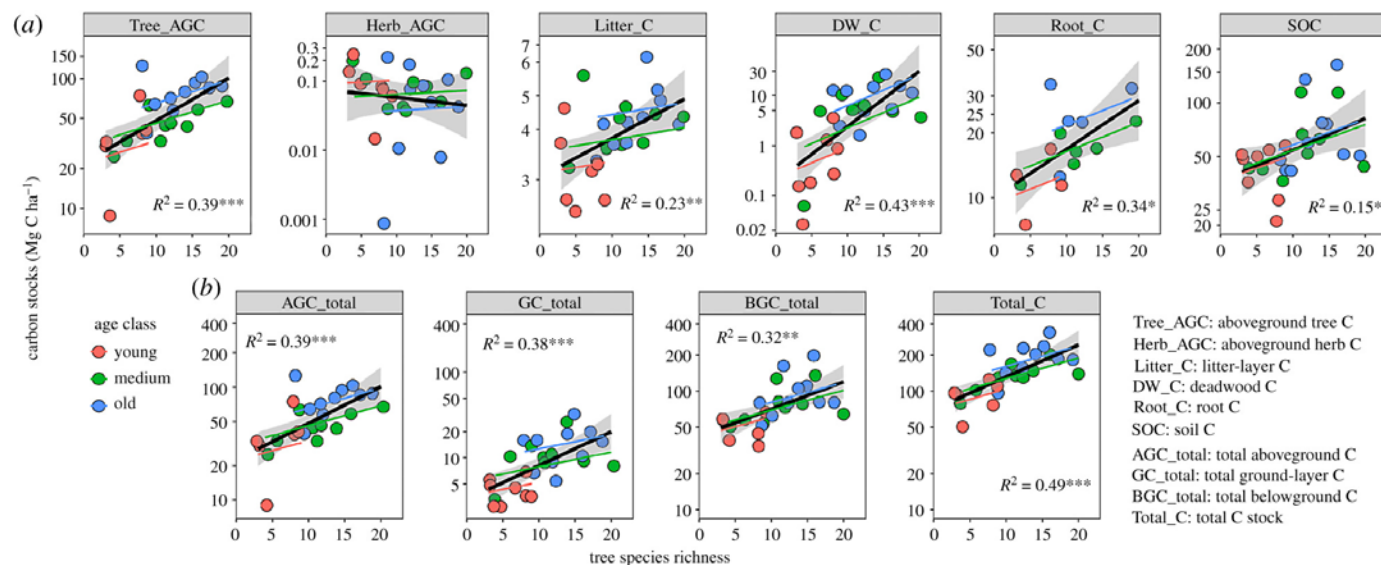
Tang et al., (2018). *Proceedings of the National Academy of Sciences*, 115(16), 4021-4026.

Conserving forests and promoting their C stock has been advocated as an effective strategy to mitigate global climate change

控制实验：乔木多样性对乔木生产力的影响



局域尺度：乔木多样性对乔木生产力的影响

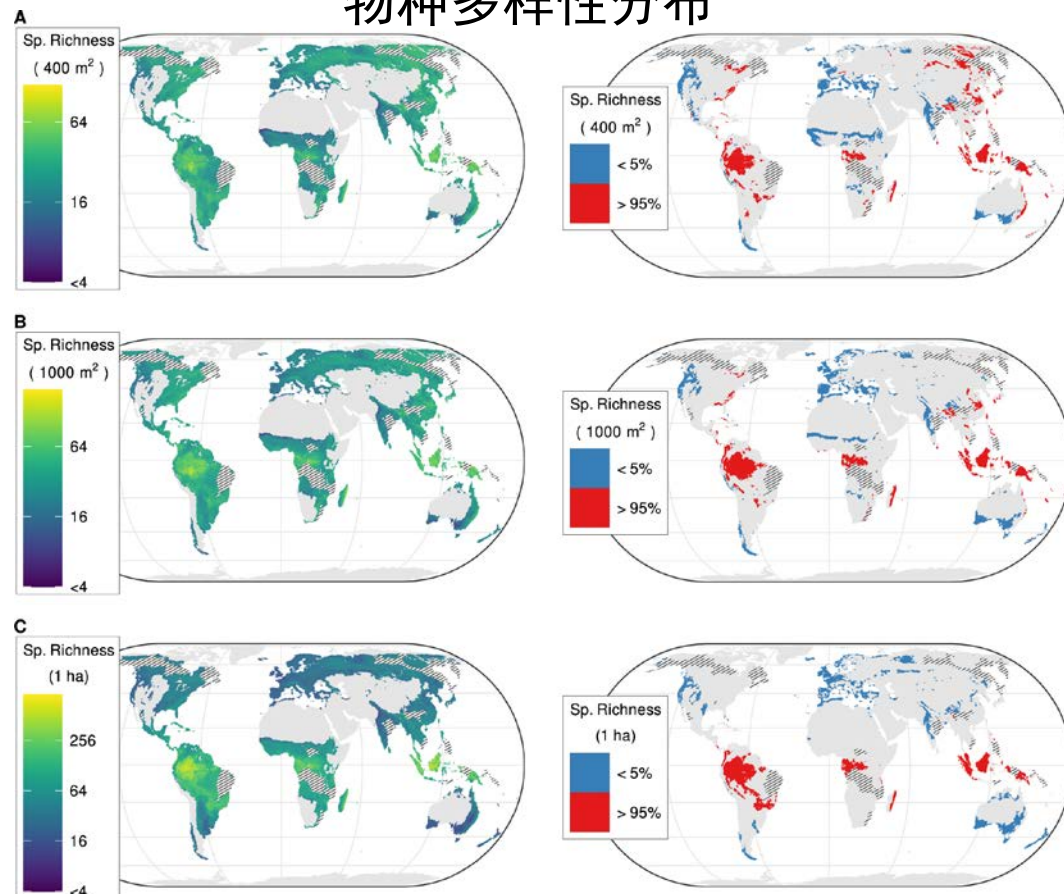


Liu et al., (2018) Proceedings of the Royal Society B, 285(1885), 20181240.

Huang et al., (2018) *Science* 362, 80–83.

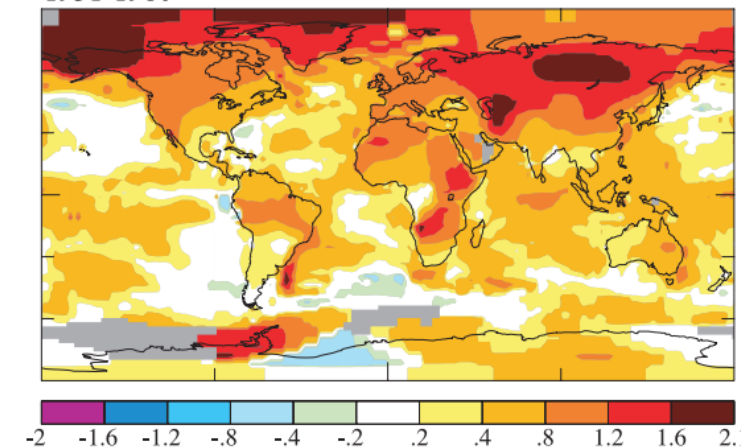
区域尺度：乔木多样性-乔木生产力关系？

物种多样性分布

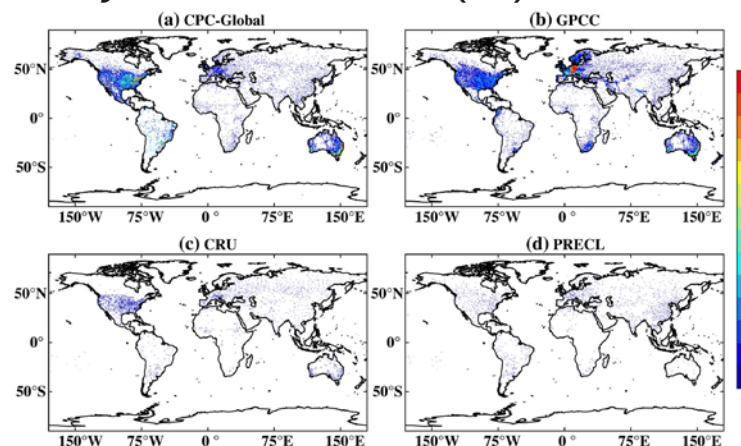


Sabatini et al., (2022) Global patterns of vascular plant alpha diversity. *Nature communications*, 13(1), 4683.

B 2001-2005 Mean Surface Temperature Anomaly (°C)
= 1951-1980 Global Mean = 0.54

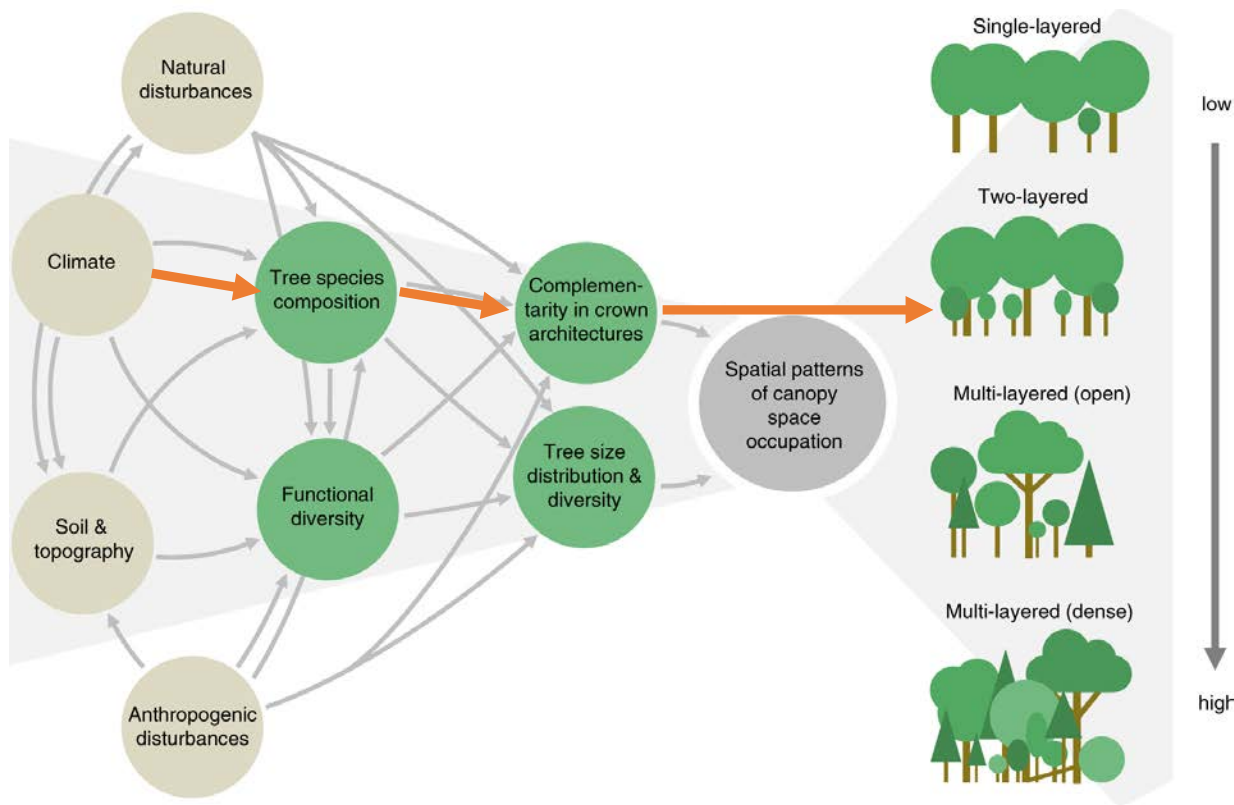


Hansen et al., (2006). *Proceedings of the National Academy of Sciences*, 103(39), 14288-14293.

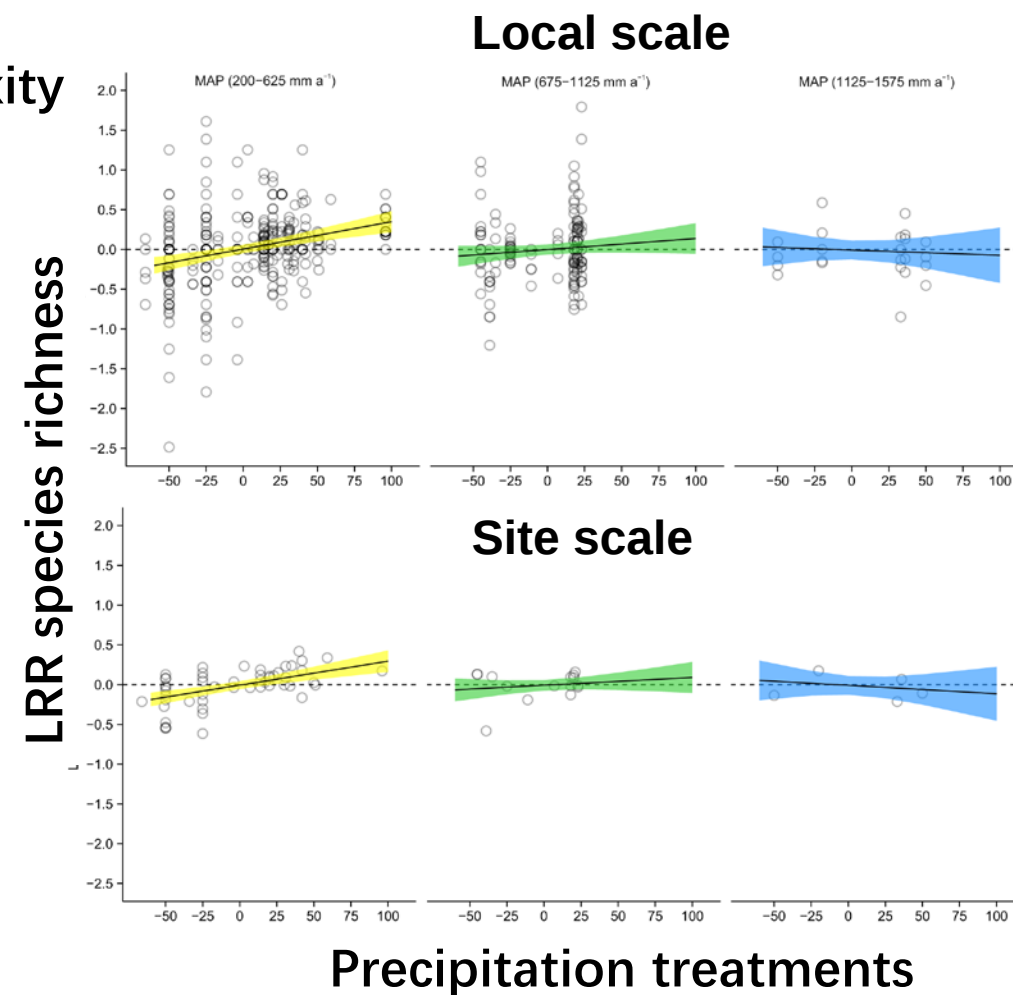


Sun et al., (2017) *Reviews of Geophysics*, 56(1), 79-107.

研究背景2

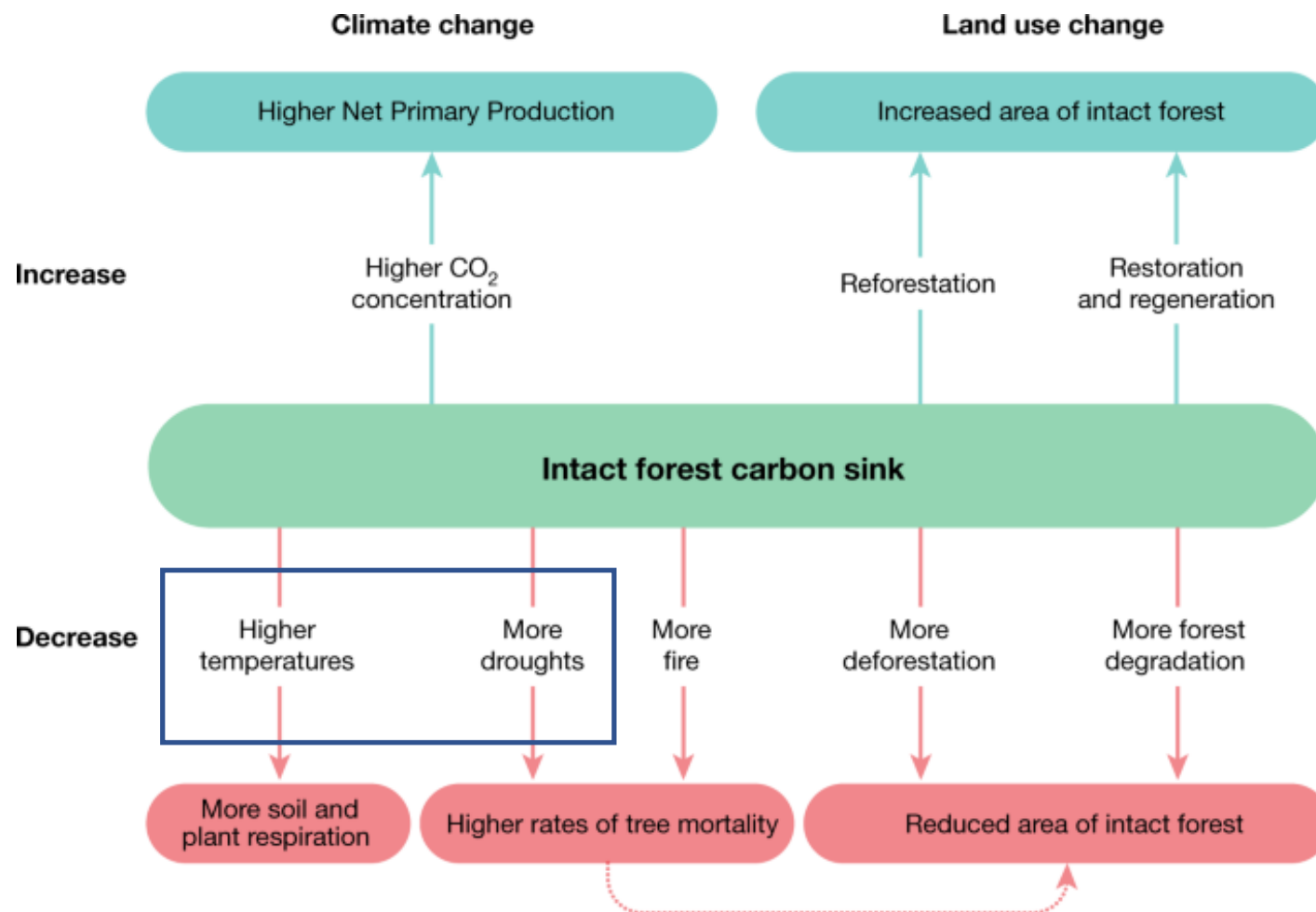


Ehbrecht et al., (2021) *Nature communications*, 12(1), 519.



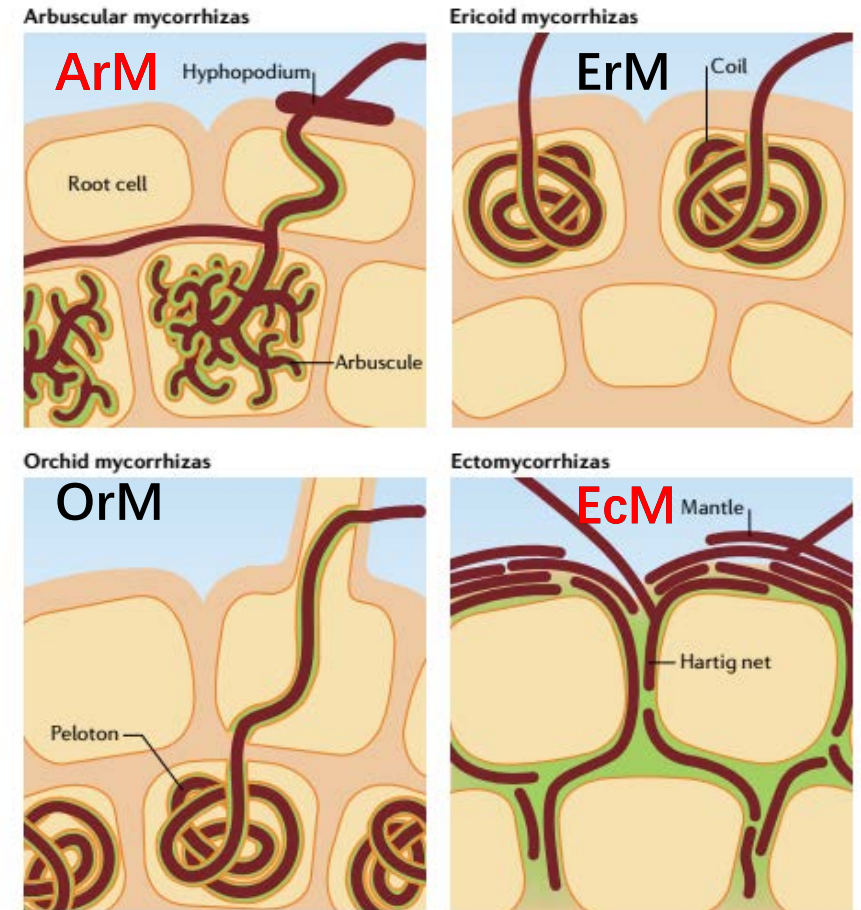
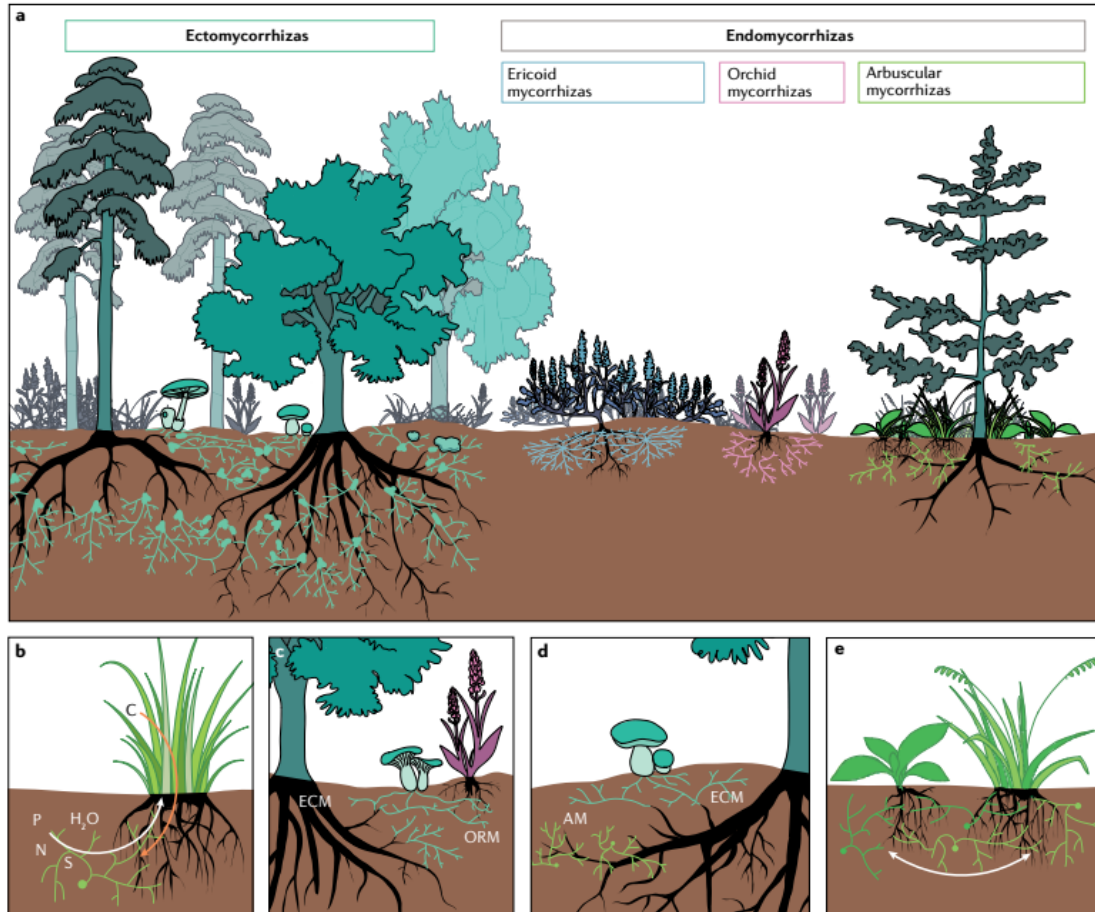
Korell et al., (2021). *Nature communications*, 12(1), 2489.

在区域尺度上，气候如何/是否调树种多样性与森林碳储量的关系？



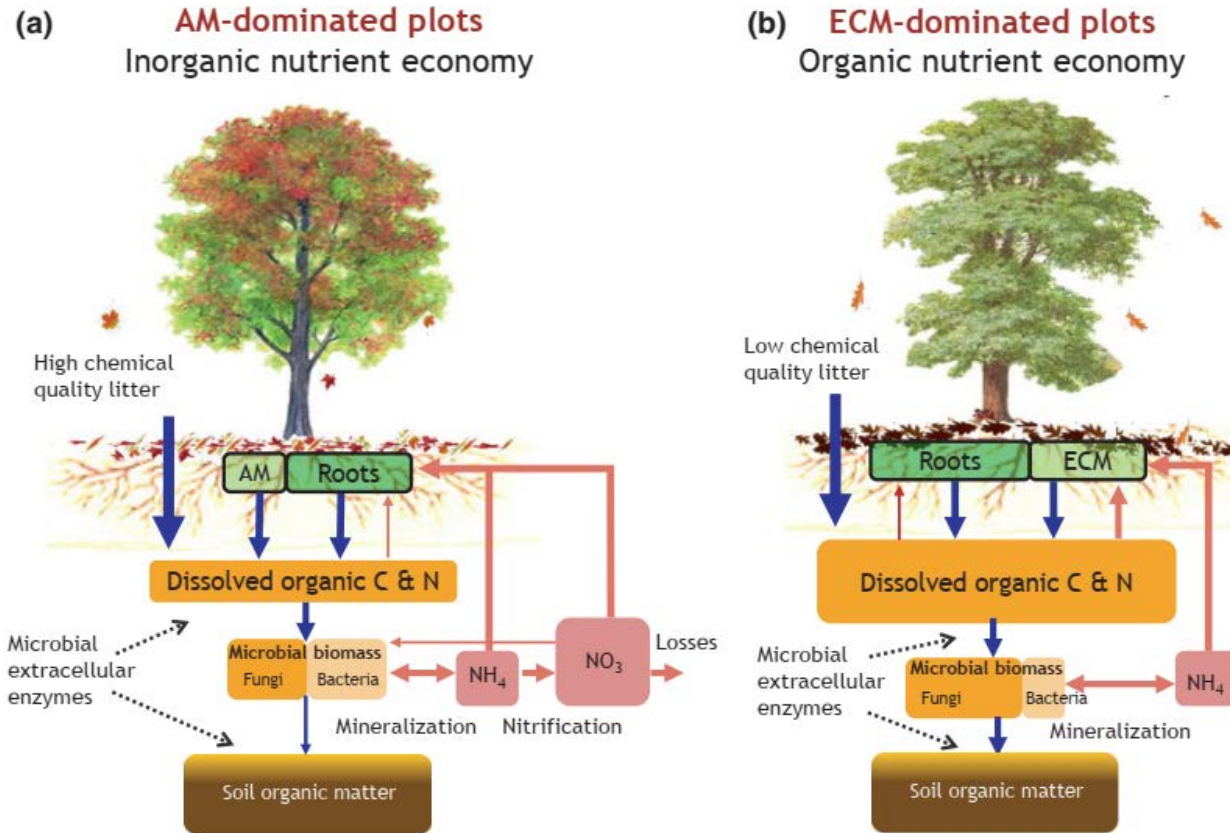
Mitchard et al., (2018). *Nature*, 559(7715), 527-534.

研究背景3

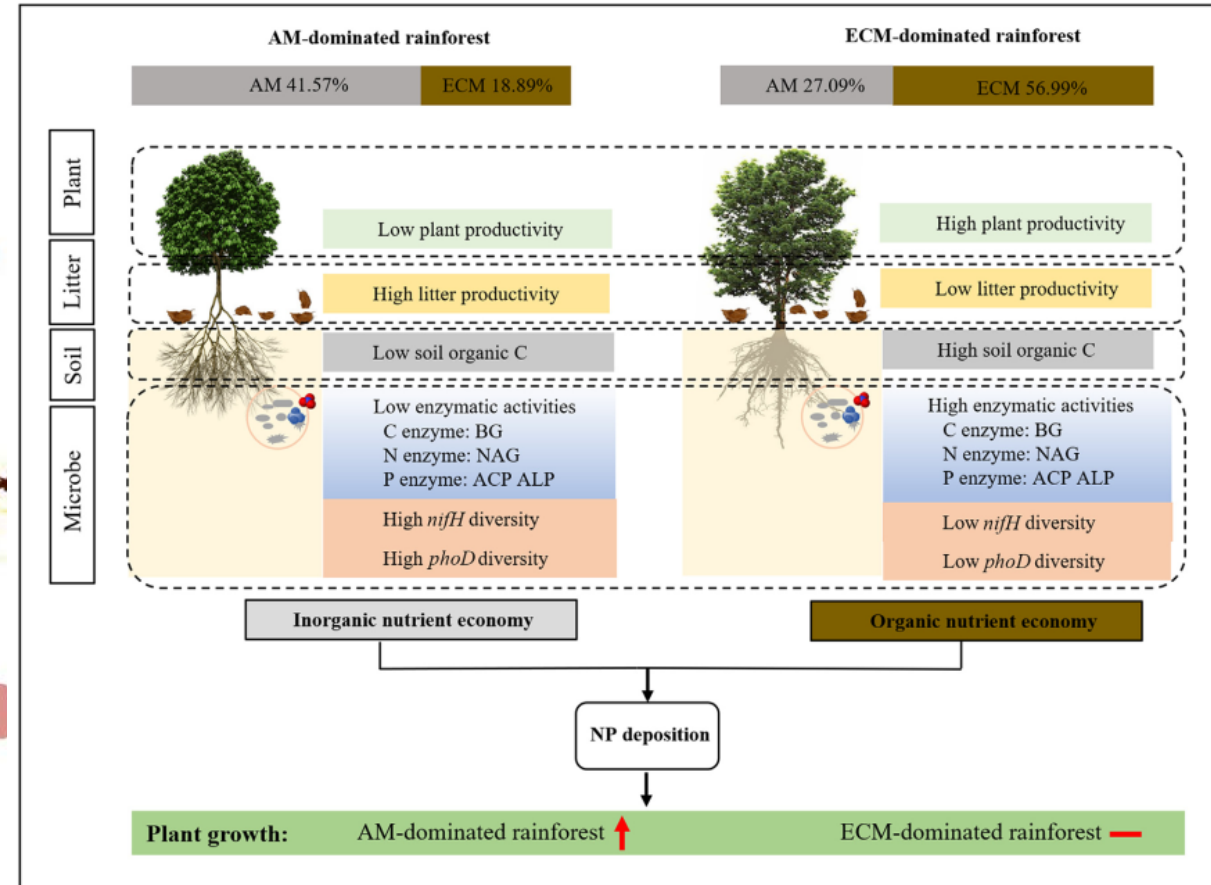


Genre et al., (2020). *Nature Reviews Microbiology*, 18(11), 649-660.

研究背景3



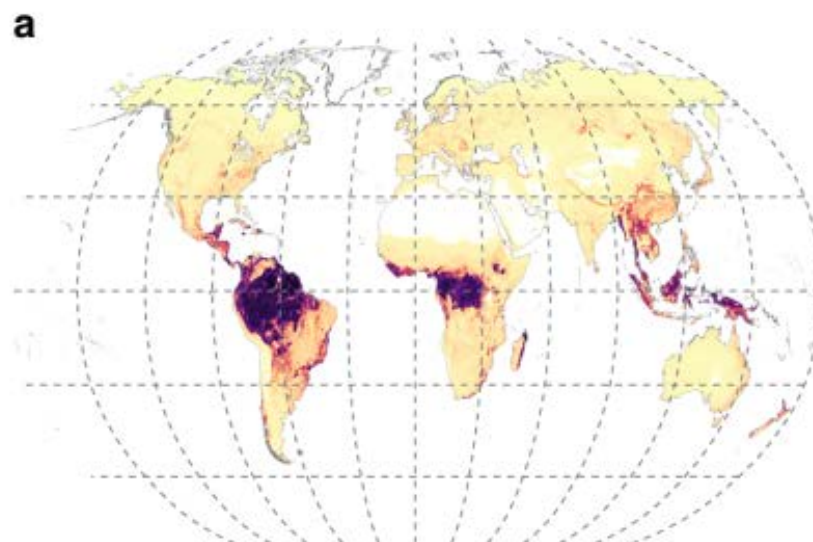
Phillips et al., (2013). *New Phytologist*, 199(1), 41-51.



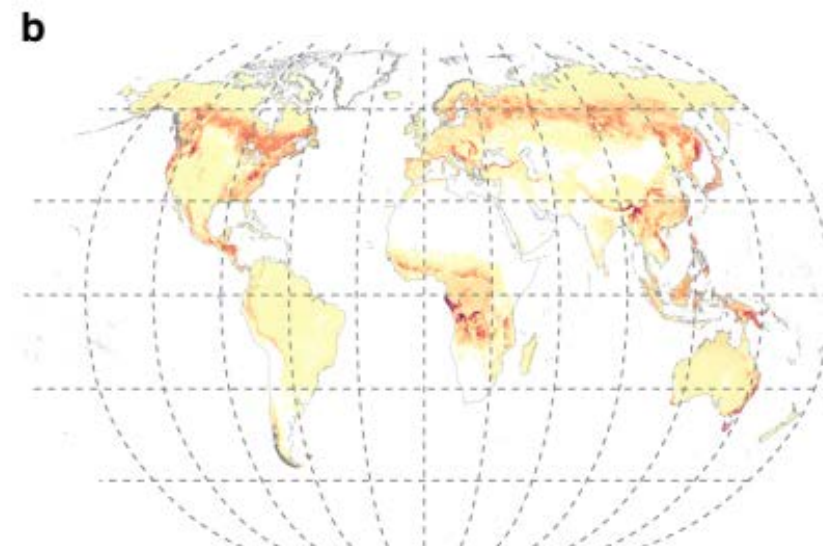
Yu et al., (2023). *Forest Ecosystems*, 10, 100083.

菌根类型如何/是否调树种多样性与森林碳储量的关系？

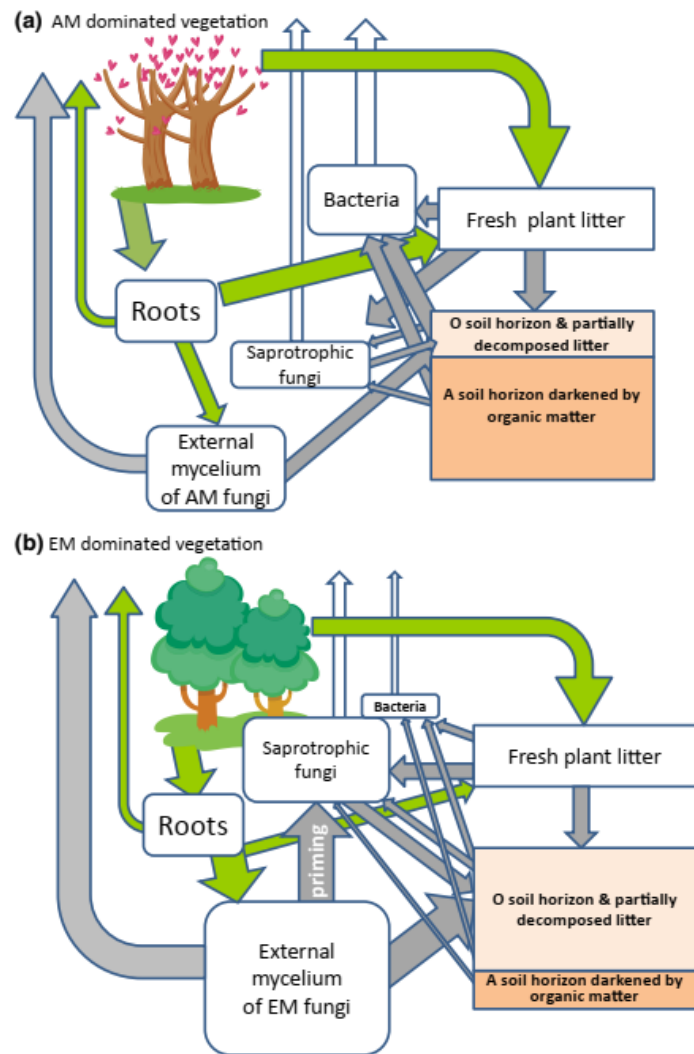
Amount of carbon stored in AM plants



Amount of carbon stored in EcM plants

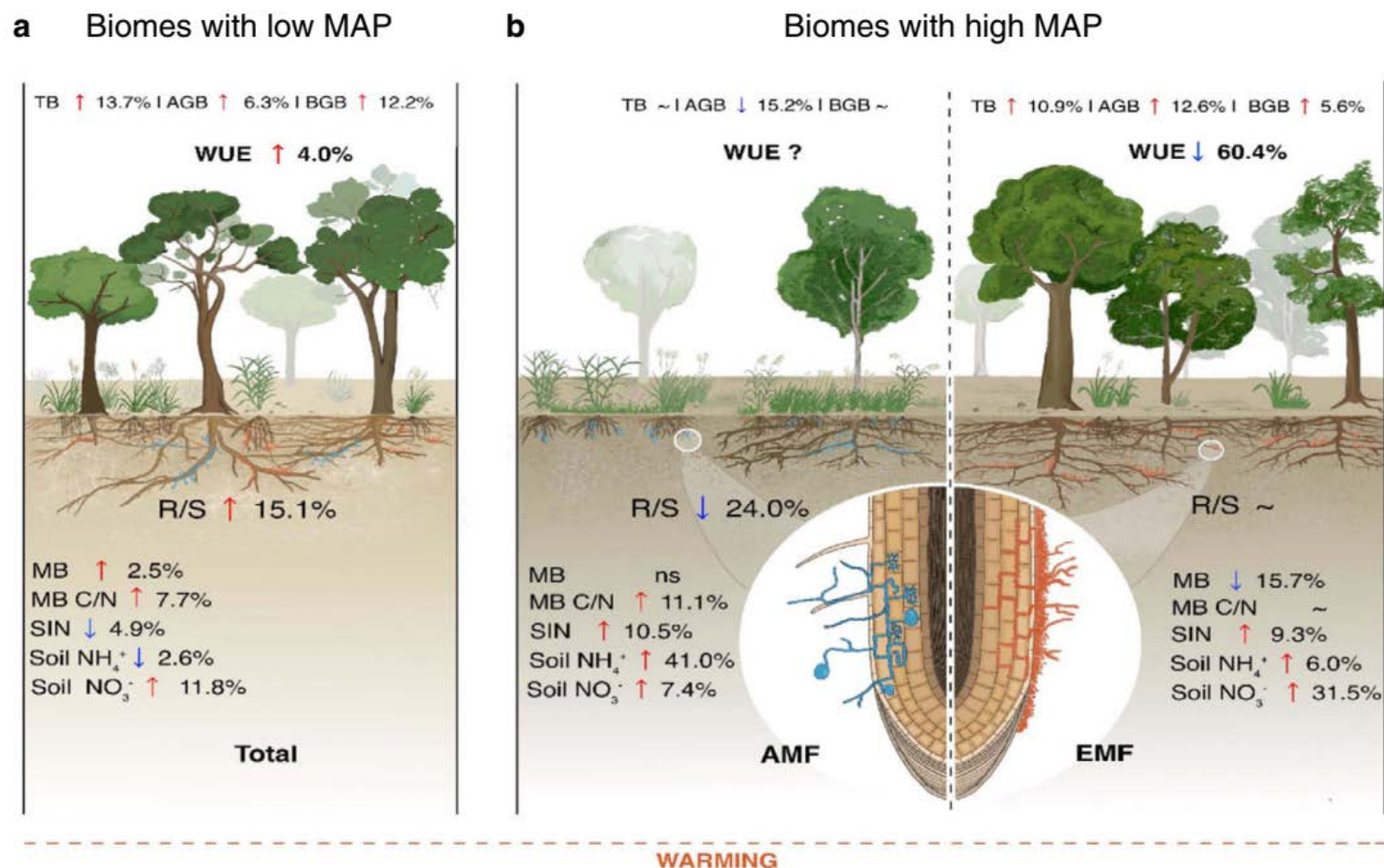


Soudzilovskaia et al., (2019) *Nature communications*, 10(1), 5077.



Soudzilovskaia et al. (2015). *New Phytologist*, 208(1), 280-293.

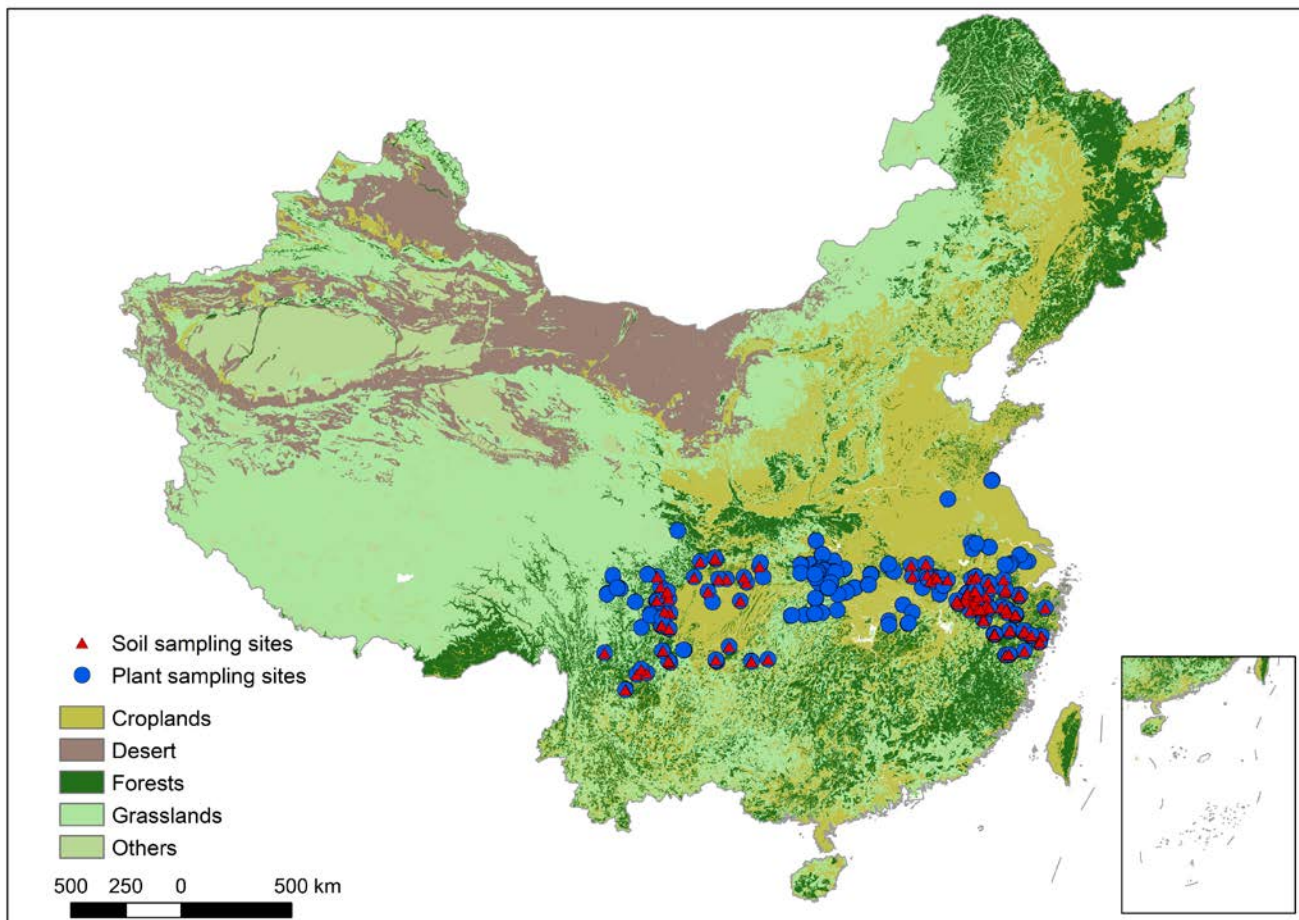
在区域尺度上，不同菌根类型植物碳储量对气候因子的响应是否相同？



Zhou et al., (2022). *Nature Communications*, 13(1), 4914.

- 1、将BEF (Biodiversity-Ecosystem Functioning) 研究从局地尺度扩展到区域尺度，树种多样性是否仍然显著促进森林生产力和碳储量？
- 2、已有研究发现气候会影响植物分布和生态系统碳储量，气候如何/是否调控树种多样性与森林碳储量的关系？
- 3、菌根类型如何/是否调节树种多样性与森林碳储量的关系，不同菌根类型植物碳储量对气候因子的响应是否相同？

研究结果



亚热带的667个森林样地的观测数据

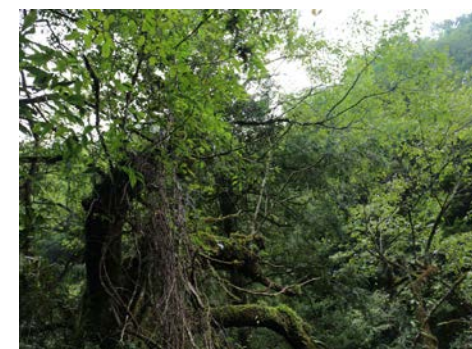


四川甘孜



浙江丽水

MAP: 467-1926 mm



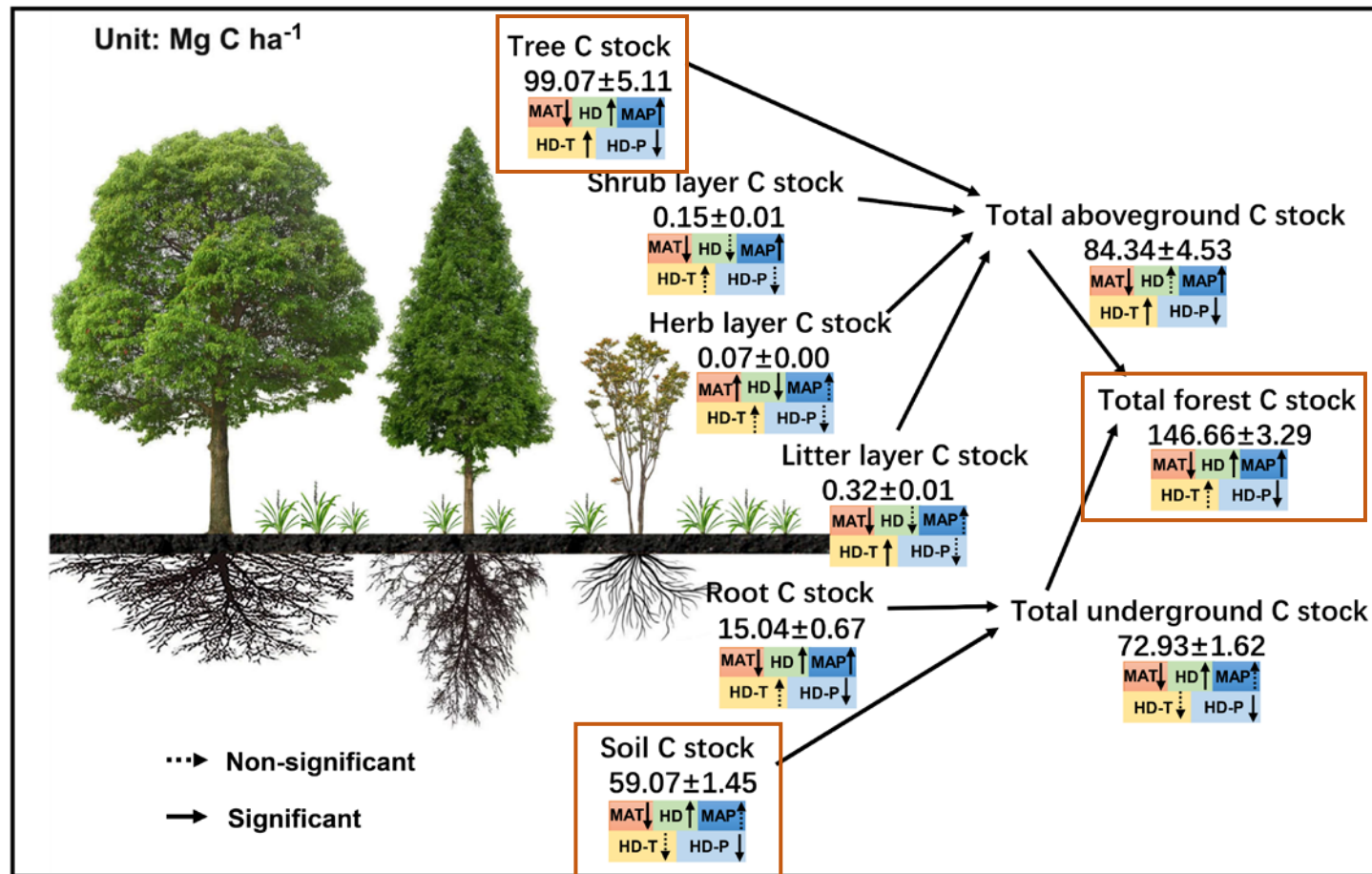
四川阿坝



贵州册亨

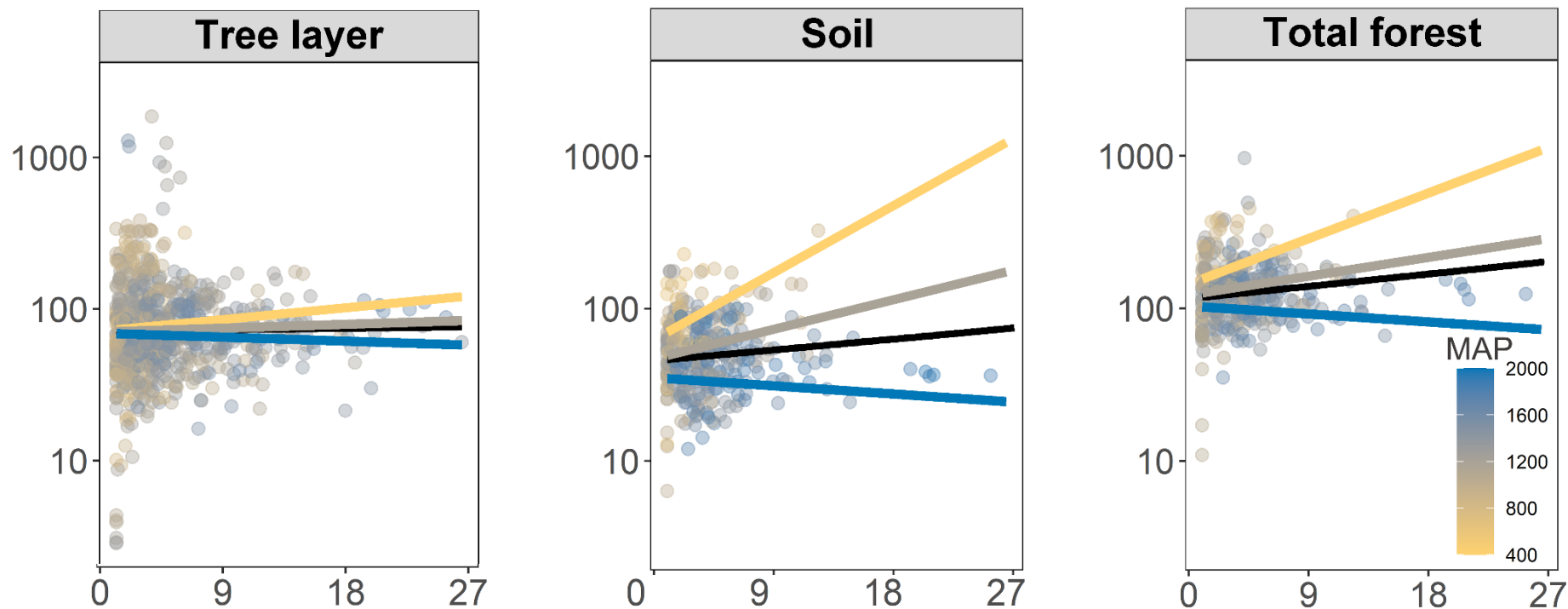
MAT: 0.3-19.7 °C

区域尺度，树种多样性是否显著促进森林生产力和碳储量？



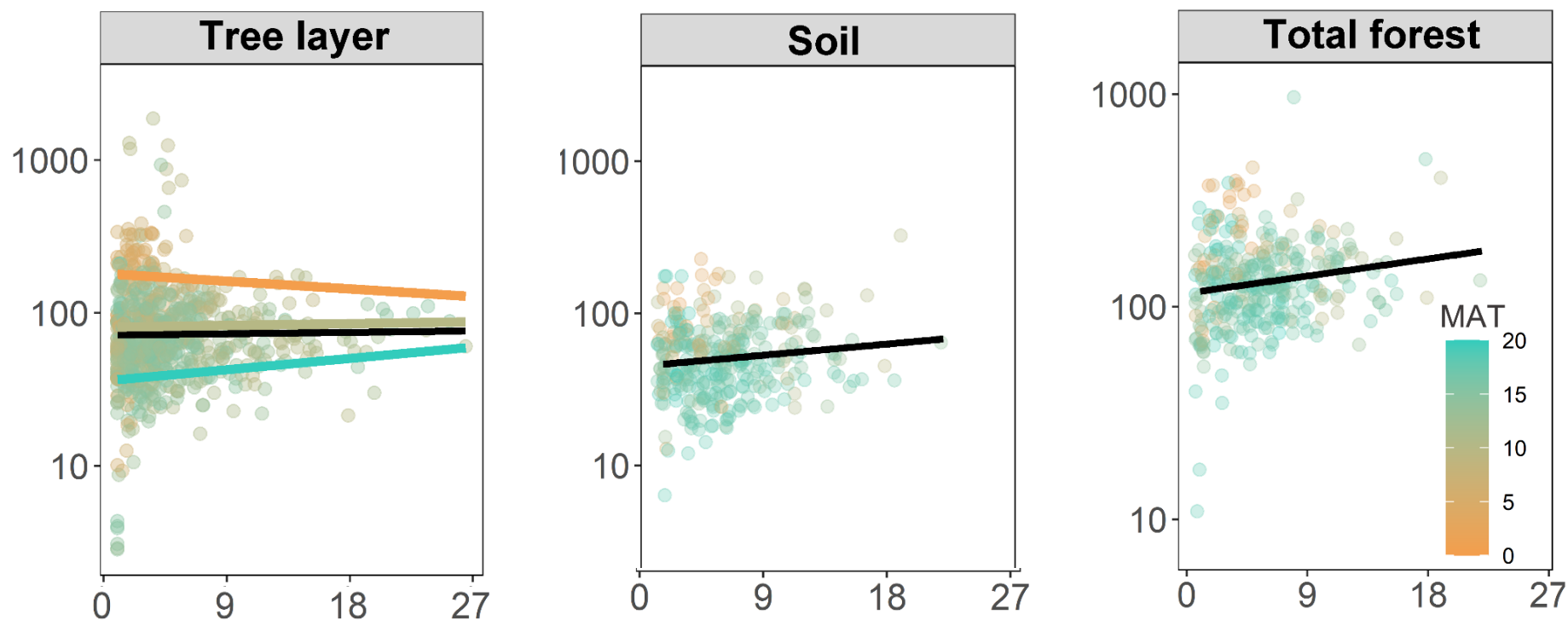
HD: tree diversity MAP: mean annual precipitation MAT: mean annual temperature

降水如何/是否调树种多样性与森林碳储量的关系？



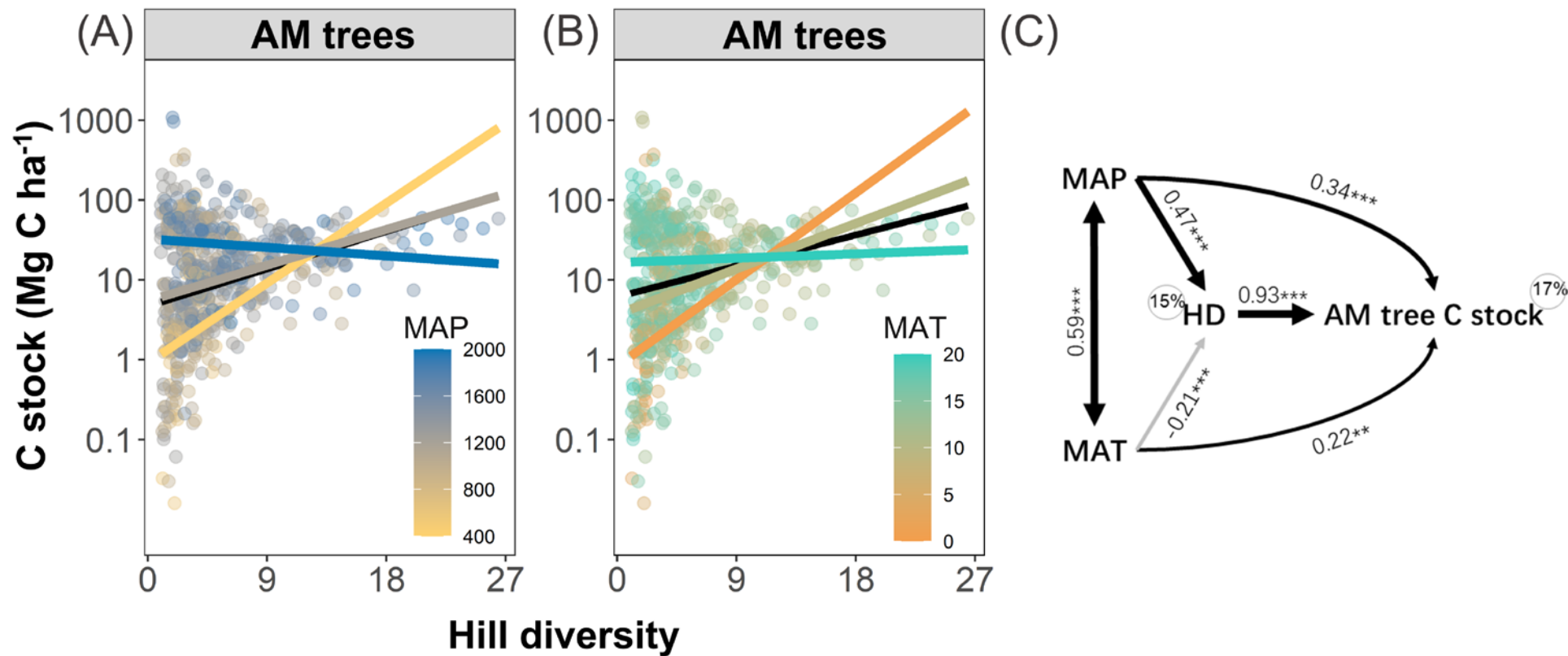
HD: tree diversity MAP: mean annual precipitation

温度如何/是否调树种多样性与森林碳储量的关系？

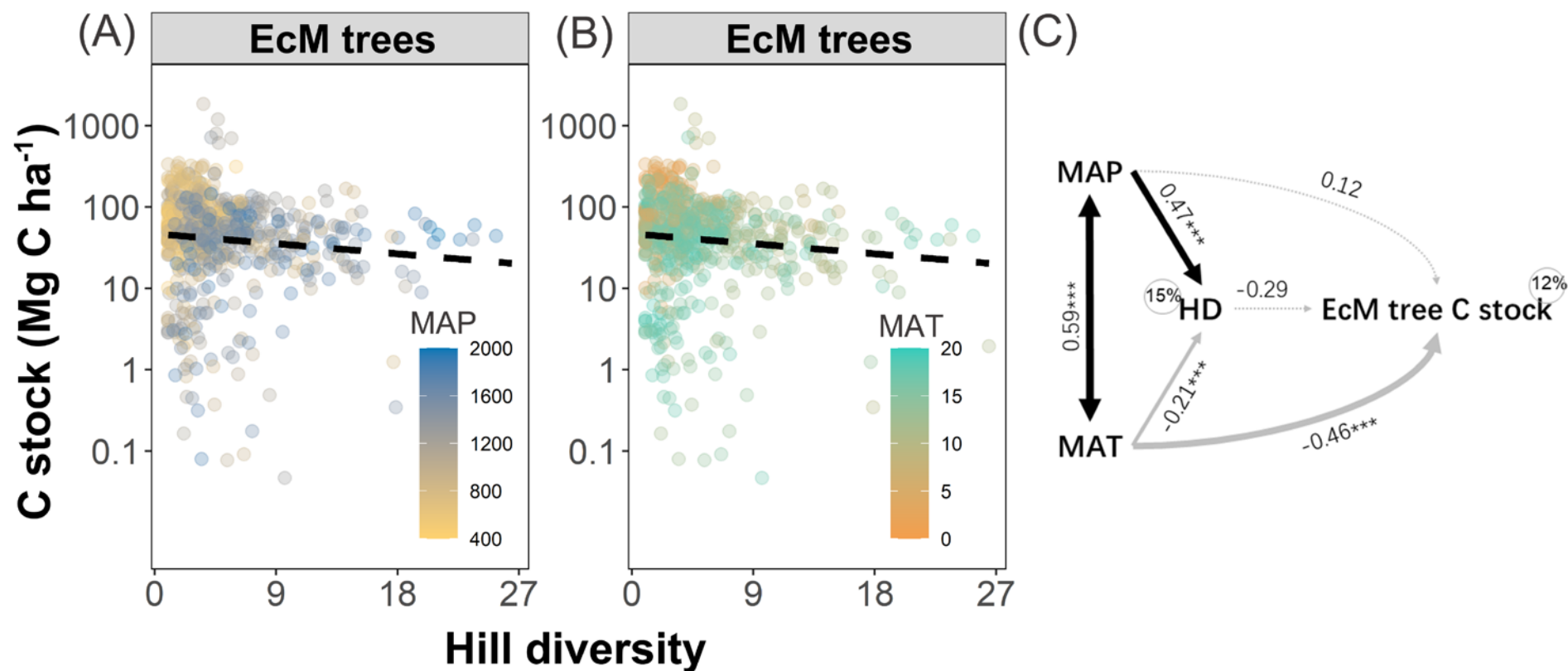


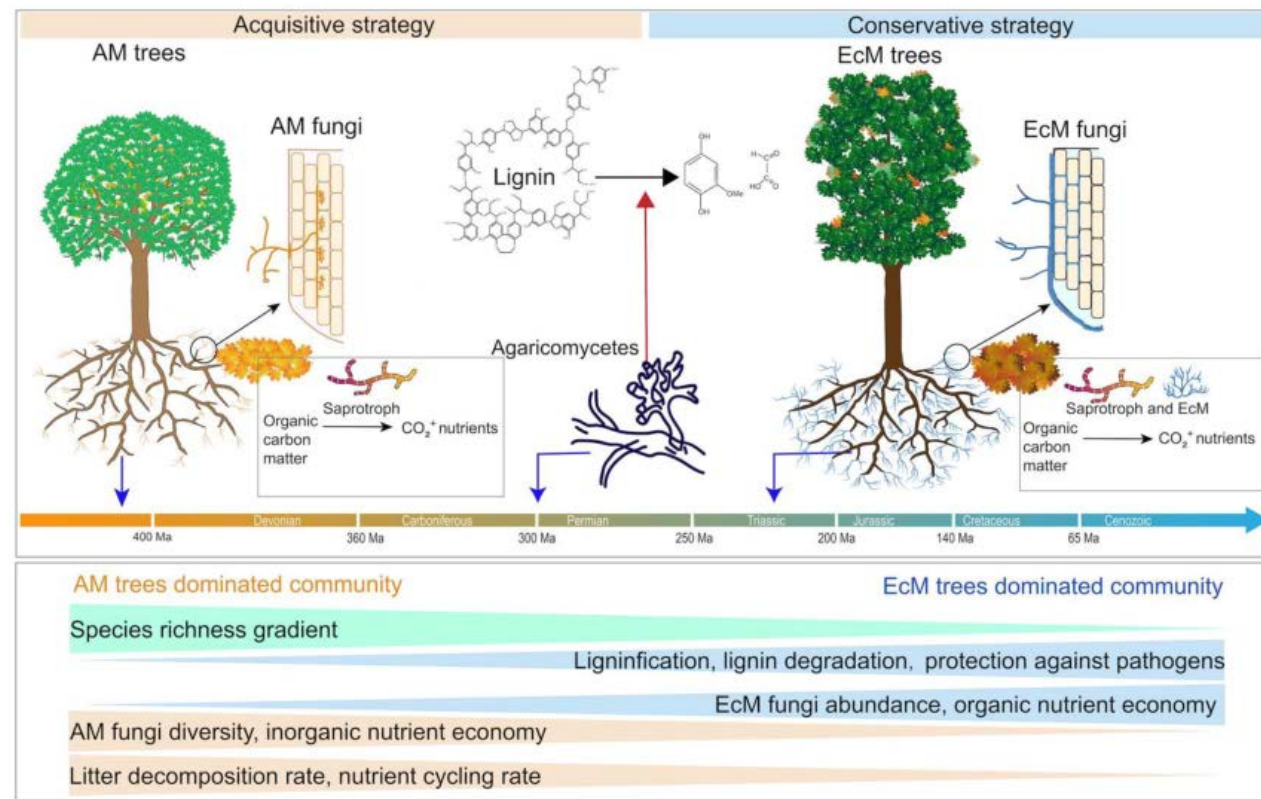
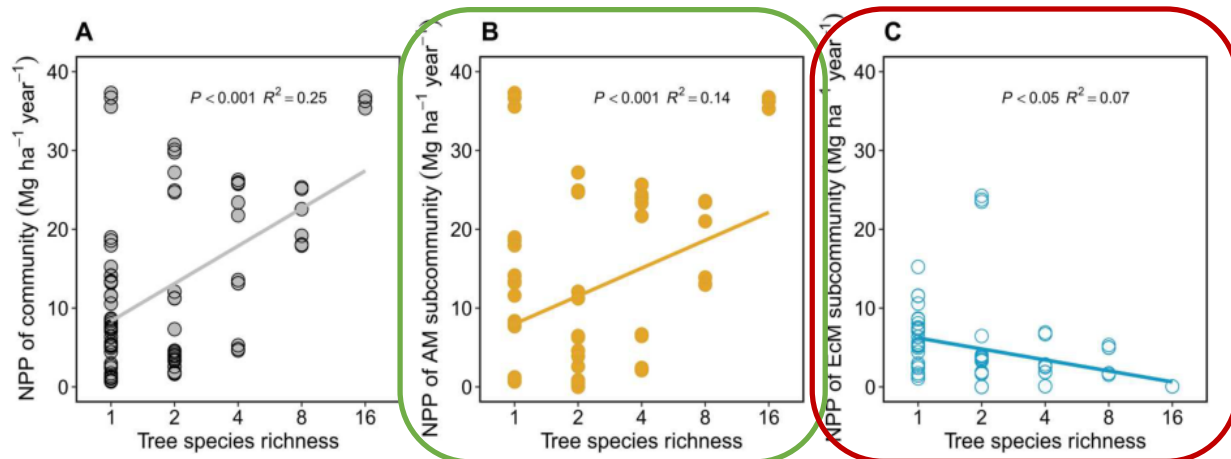
HD: tree diversity MAT: mean annual temperature

菌根类型如何/是否调树种多样性与森林碳储量的关系？



菌根类型如何/是否调树种多样性与森林碳储量的关系？





研究意义

Climate and mycorrhizae mediate the relationship of tree species diversity and carbon stocks in subtropical forests

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Guoke Chen¹ | Haoru Yan^{1,6} | Xianglu Deng^{1,6} | Keping Ma^{1,6} | Xiaojuan Liu¹

¹State Key Laboratory of Vegetation and Environmental Change, Institute of Botany, the Chinese Academy of Sciences, Beijing, China; ²School of Life Sciences, Qufu Normal University, Qufu, China; ³Institute of Biology/Geobotany and Botanical Garden, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany; ⁴German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany; ⁵Fujian Provincial Key Laboratory of Resources and Environmental Monitoring and Sustainable Management and Utilization, Sanming University, Sanming, China and ⁶College of Life Sciences, University of Chinese Academy of Sciences, Beijing, China

总结:

- 在区域尺度上，树种多样性仍可以显著促进森林碳储量；
- 升温增加了亚热带森林乔木多样性—乔木碳储量的关系；降水增加减弱了亚热带森林乔木多样性—乔木碳储量关系，但都没有改变其关系方向。**说明：**在压力条件下，树种多样性对森林碳储量的促进作用会加强；在有利的气候条件下，树种多样对森林碳储量的促进作用会减弱。
- 亚热带地区只有丛枝菌根树种碳储量与树种多样性呈显著正相关，且只有丛植菌根树种与气候因子存在交互作用。**说明：**菌根类型调节树种多样性—森林碳储量的关系及其对气候因子的响应。

这些结果表明：

在更大尺度上研究物种多样性与生态系统功能关系时需考虑气候和菌根类型的影响

致谢



- Thank you for your attention!
- 敬请各位老师批评指正!



汇报人：闫国永