

How do mature European beech and Norway spruce trees regulate water use during repeated drought?

-Leaf physiology and morphology-

Kyohsuke Hikino*, Benjamin D. Hesse, Timo Gebhardt, Benjamin D. Hafner, Karl-Heinz Häberle, and Thorsten E.E. Grams

* Ecophysiology of plants, Technical University of Munich, kyohsuke.hikino@tum.de

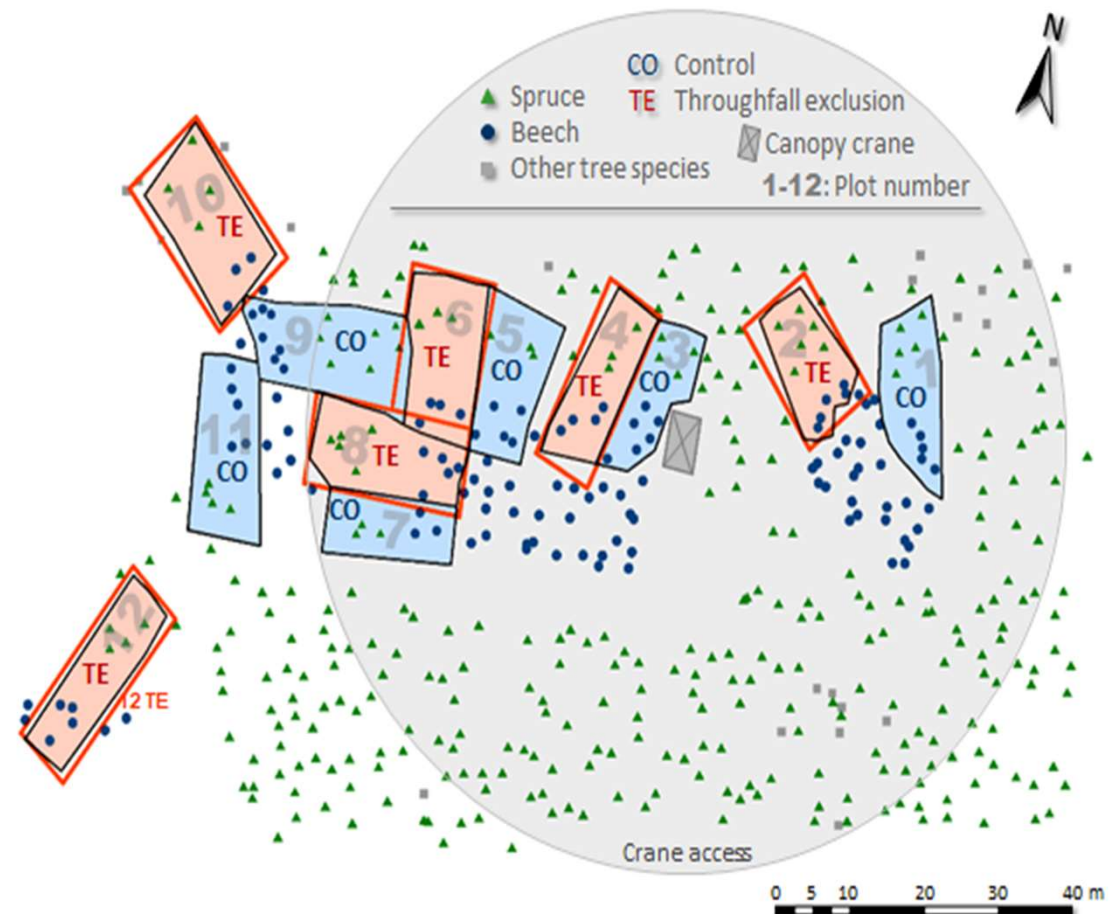


Kranzberg ROOF Project

Repeated drought (2014 - 2018)

European Beech: more anisohydric

Norway Spruce: more isohydric

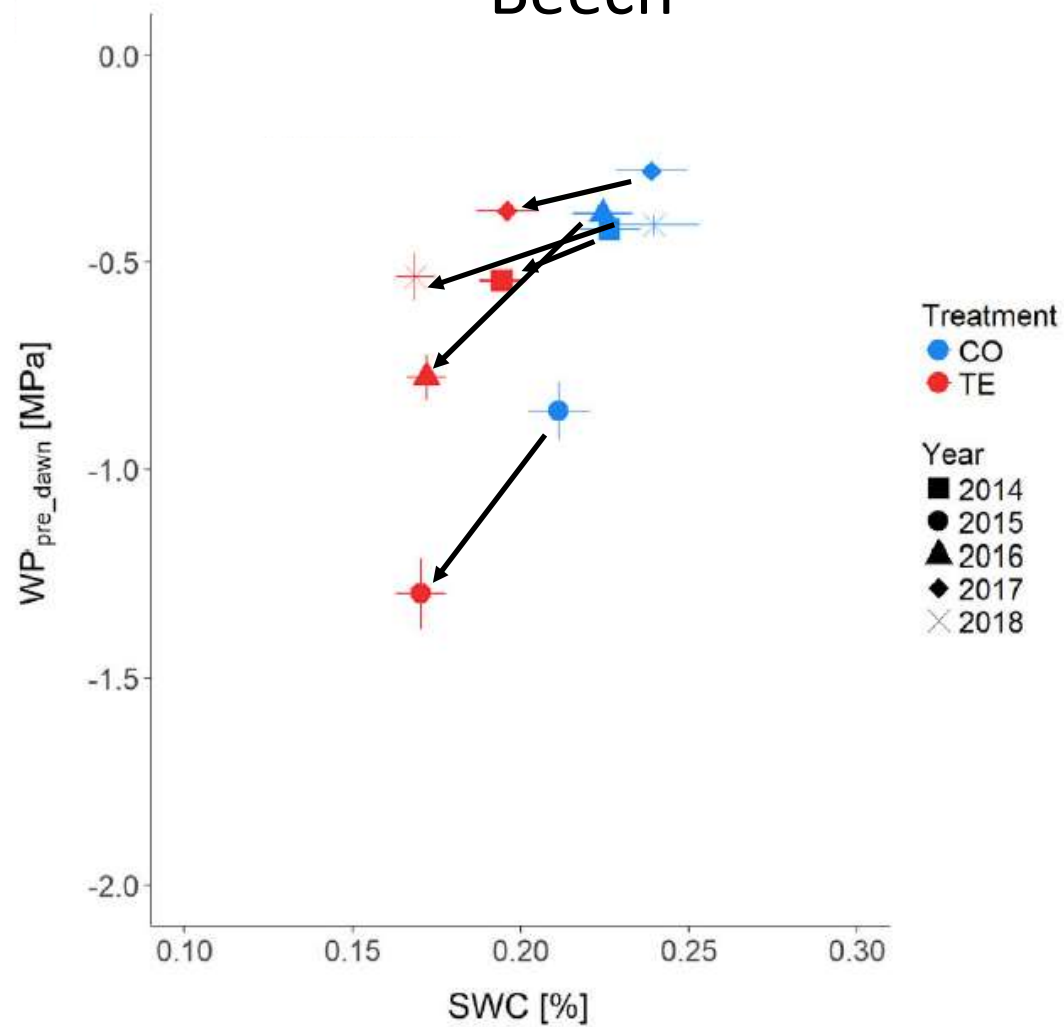


Grams & Hesse et al. 2021, Ecosphere

Hikino et al. EGU 2022-8419, Session BG3.11

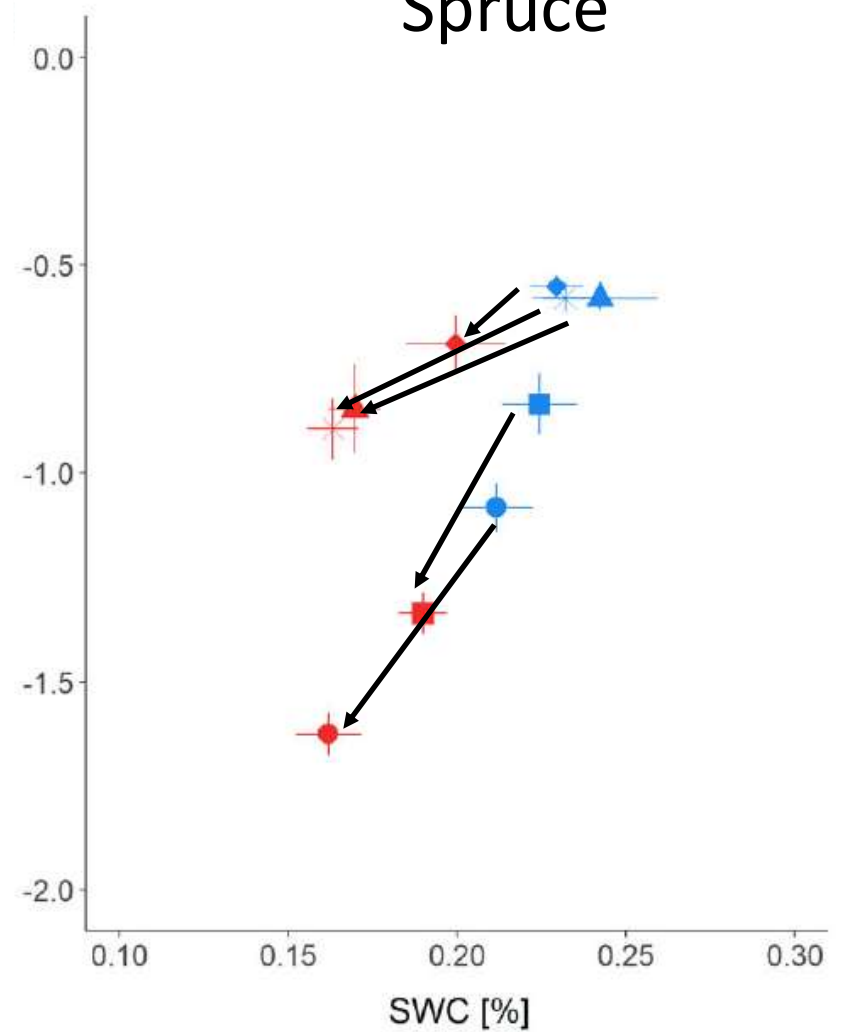


Beech



Hikino et al. EGU 2022-8419, Session BG3.11

Spruce

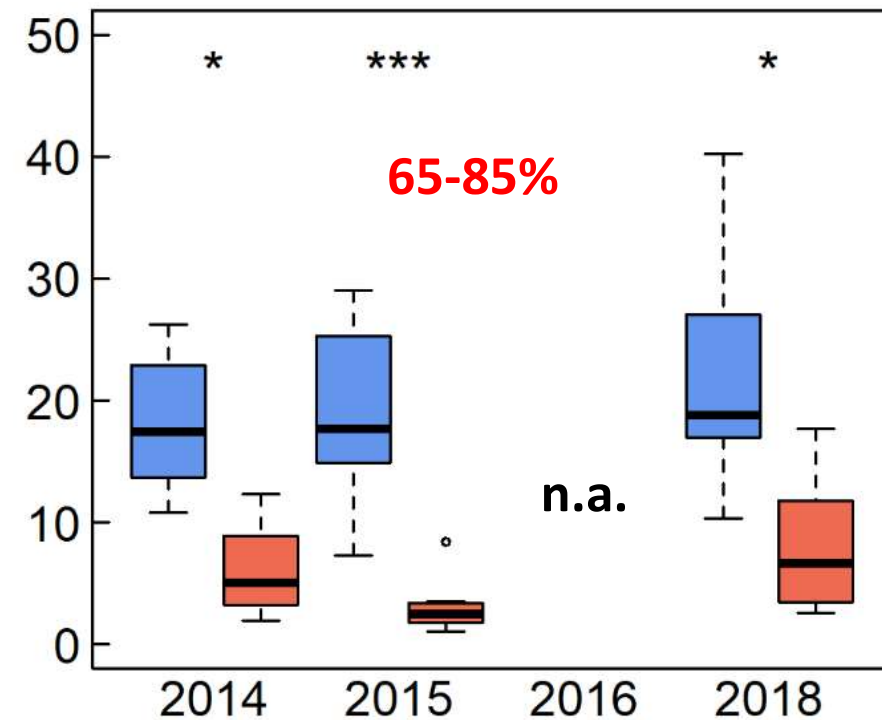
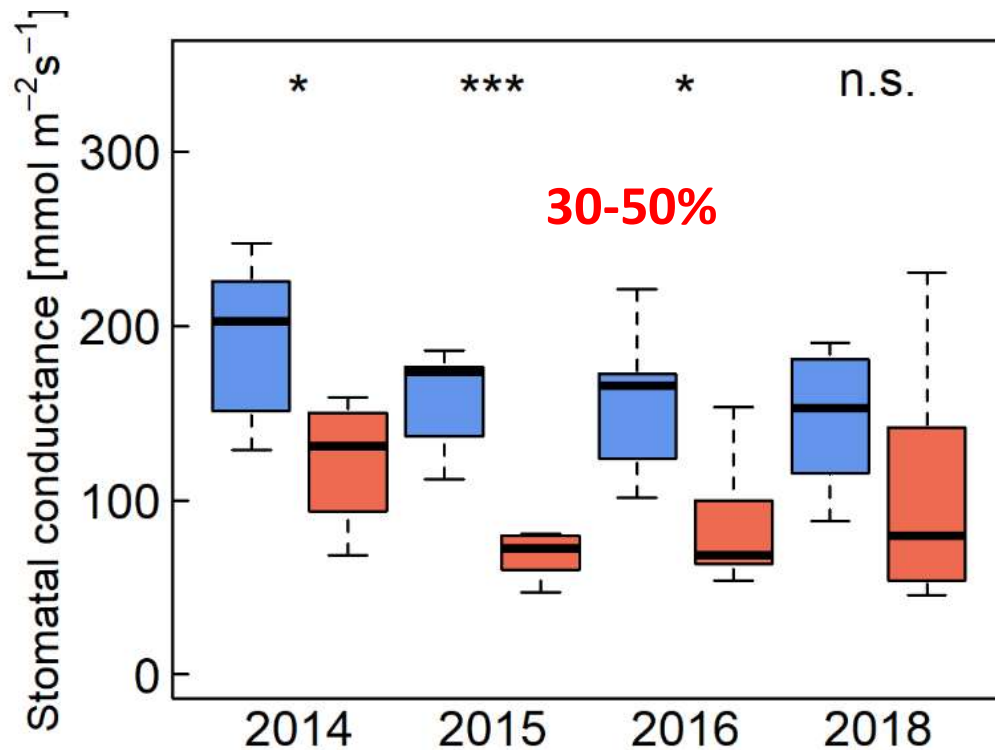


Grams & Hesse et al. 2021 Ecosphere

1) Stomatal control as a first drought response

Beech more anisohydric

Spruce more isohydric



Control
Drought

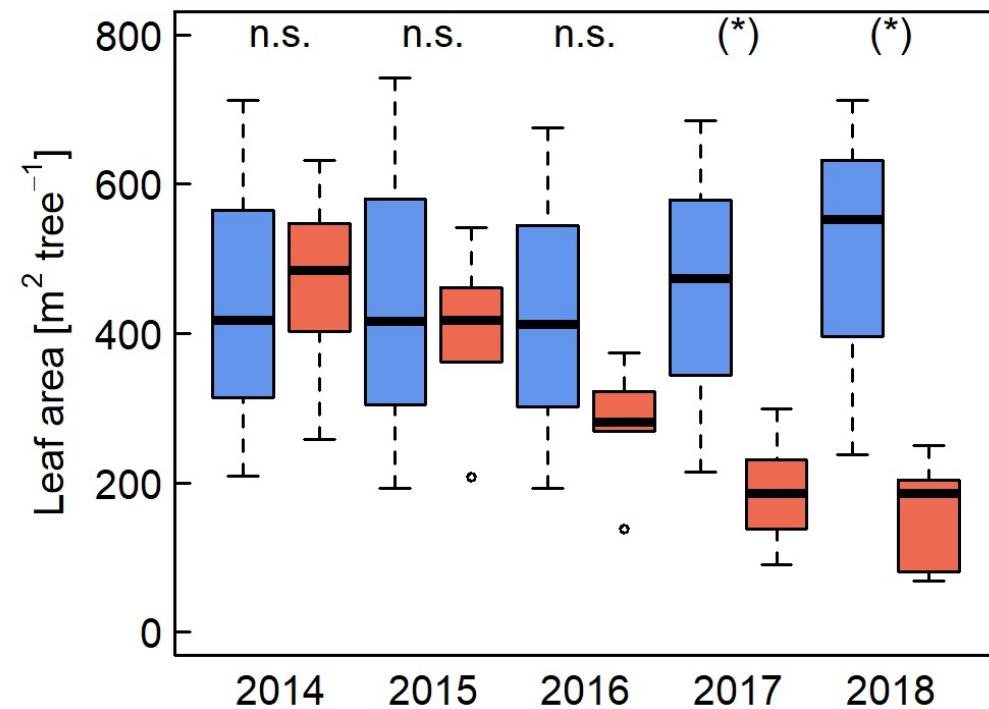
→ Stronger stomatal control in spruce

2) Morphological adjustments? -Spruce-

Control

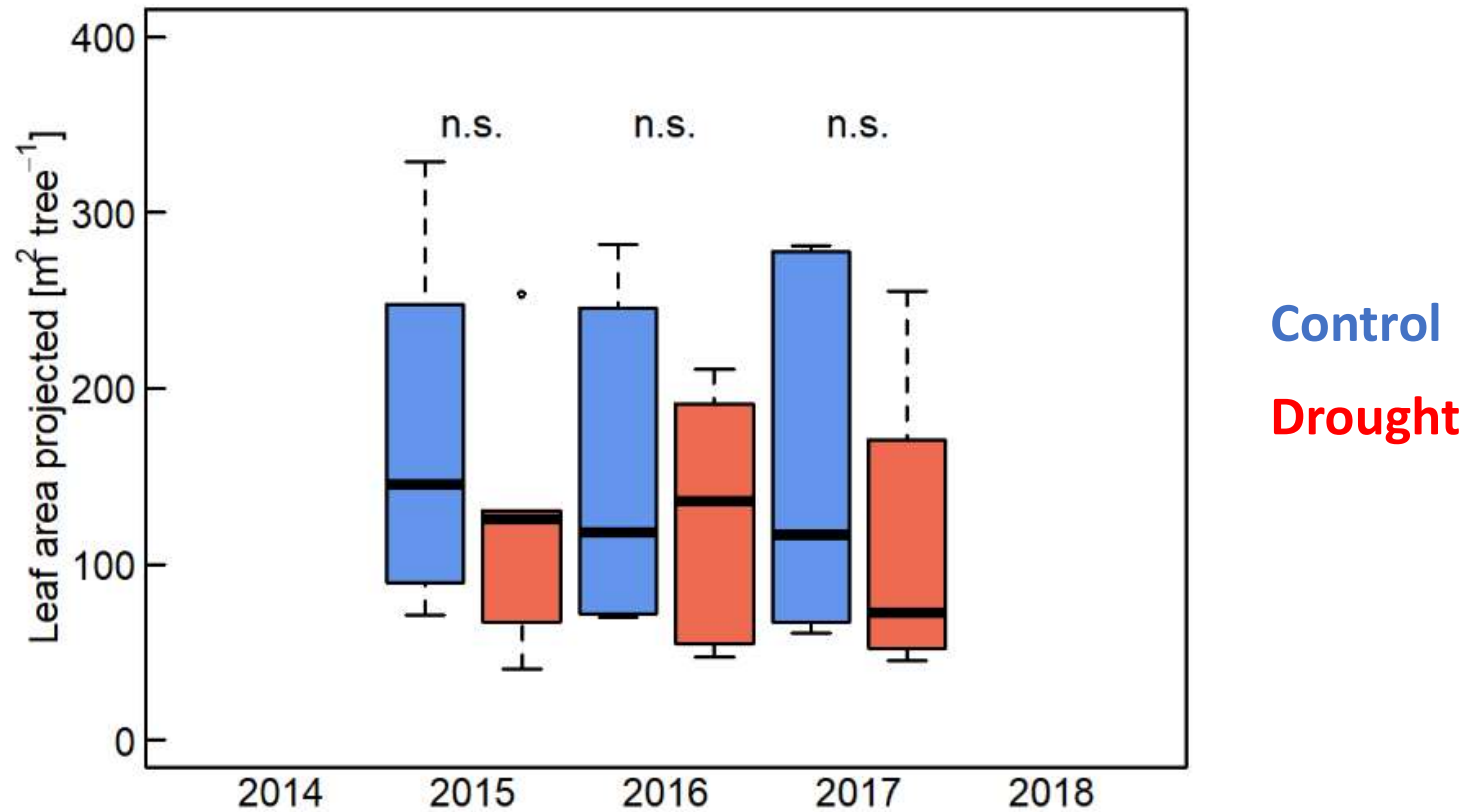


Drought



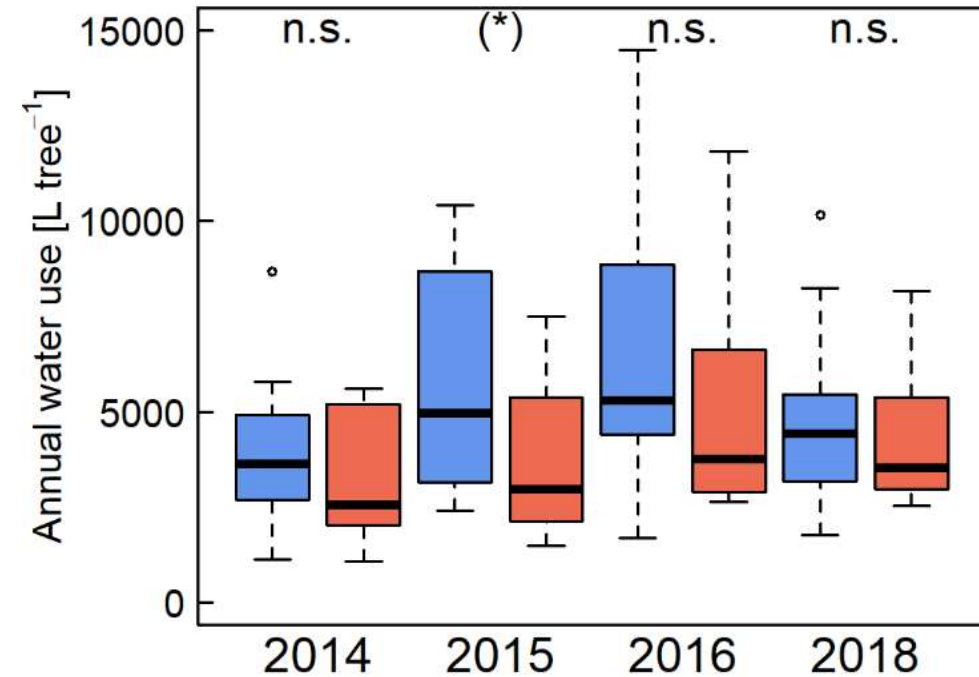
→ Significant reduction (by >50%)

2) Morphological adjustments? -Beech-



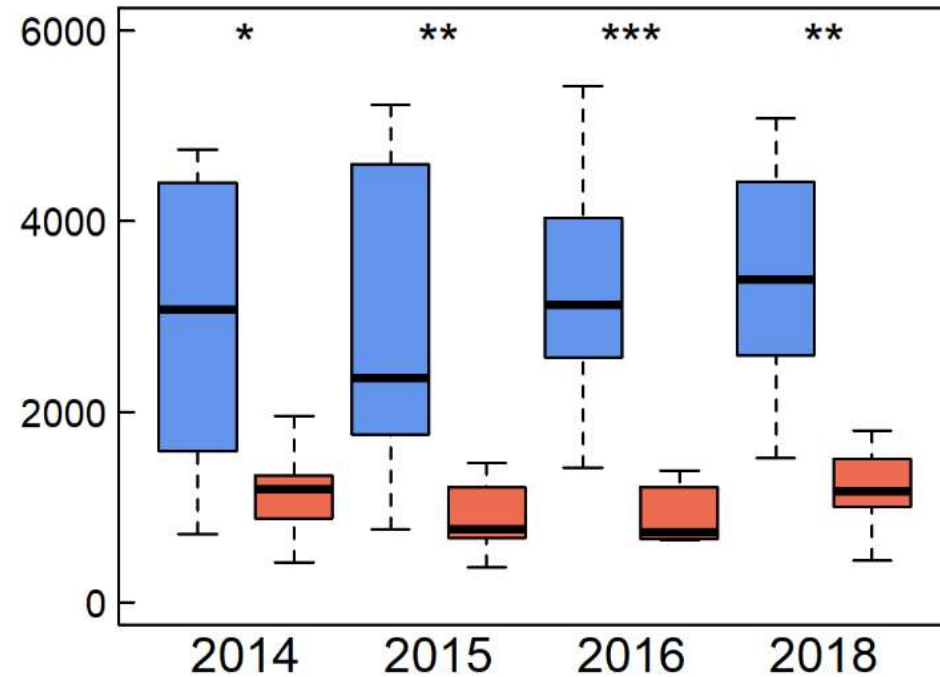
→ No significant change

Beech



Mainly through stomatal control

Spruce



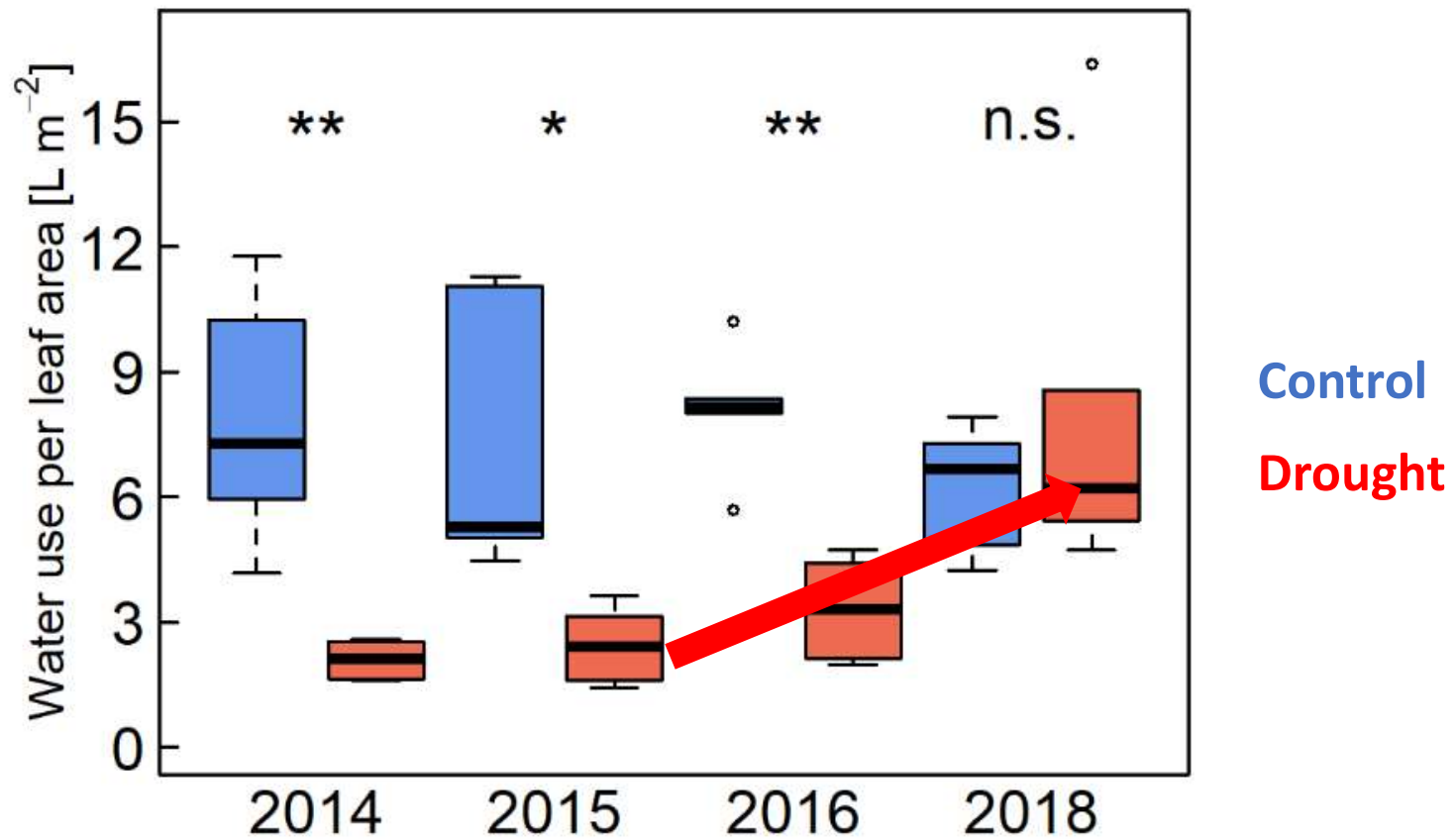
Control
Drought

Only stomatal control

+ Morphology

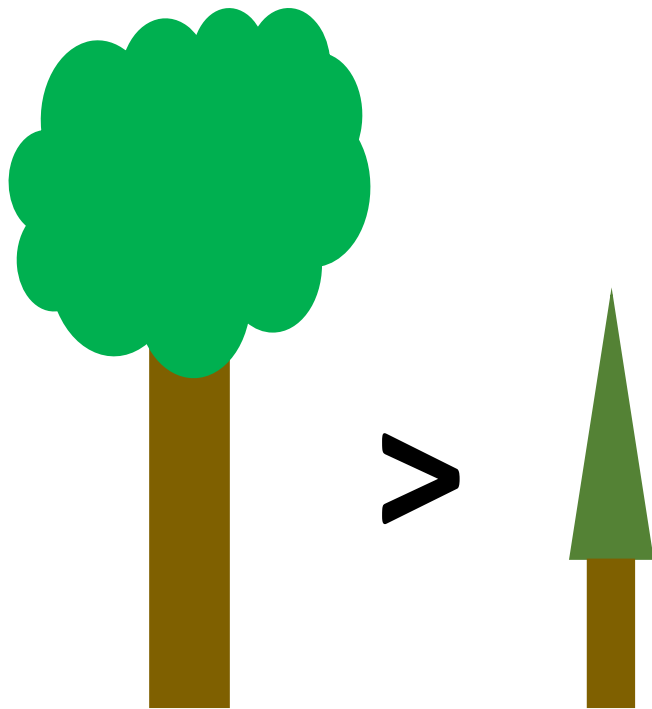
→ However, no further decrease despite reduced leaf area

Spruce



→ Increased water (and C uptake) per leaf area

Summary + Outlook



Low mortality

Delayed soil drying

Beech benefited from neighboring drought-stressed spruce?

Acknowledgement



Thomas Feuerbach, Josef Heckmair, Peter Kuba, Michael Goisser,
Vjosa Dervishi, Florian Motte, Hans Pretzsch, Matthias Ulbricht,
Bachelor/Master students

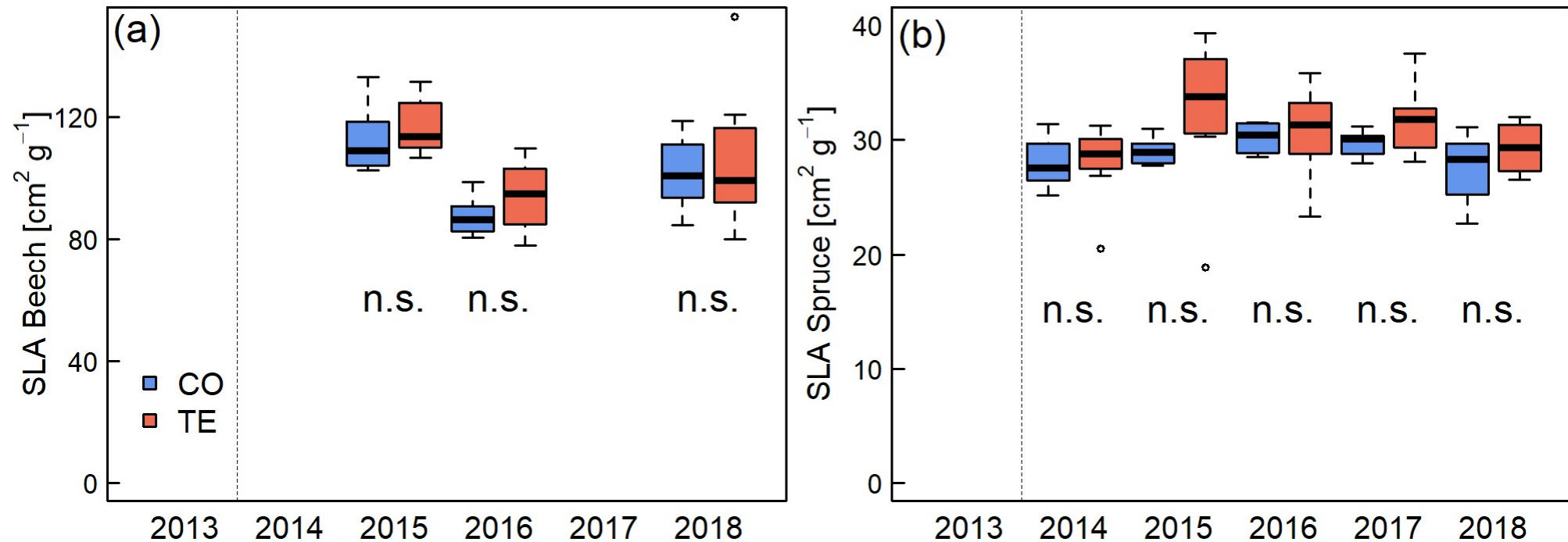


Deutsche Forschungsgemeinschaft



Bayerische Staatsministerien für Umwelt und Verbraucherschutz sowie
für Ernährung, Landwirtschaft und Forsten

2) Morphological adjustments? -SLA-



→ No adjustment in leaf quality