

GLOBAL CHANGE

Atmospheric chemistry

strat. O₃ ↓
CO₂ ↑
NO_x ↑
others ↑
dust ↑

Climate

temperature ↑
humidity ↓ ↑
cloud cover ↑
precipitation ↑
storms ↑

extremes
winter
summer

sum
extremes
temporal
distribution

organisms:

microbes

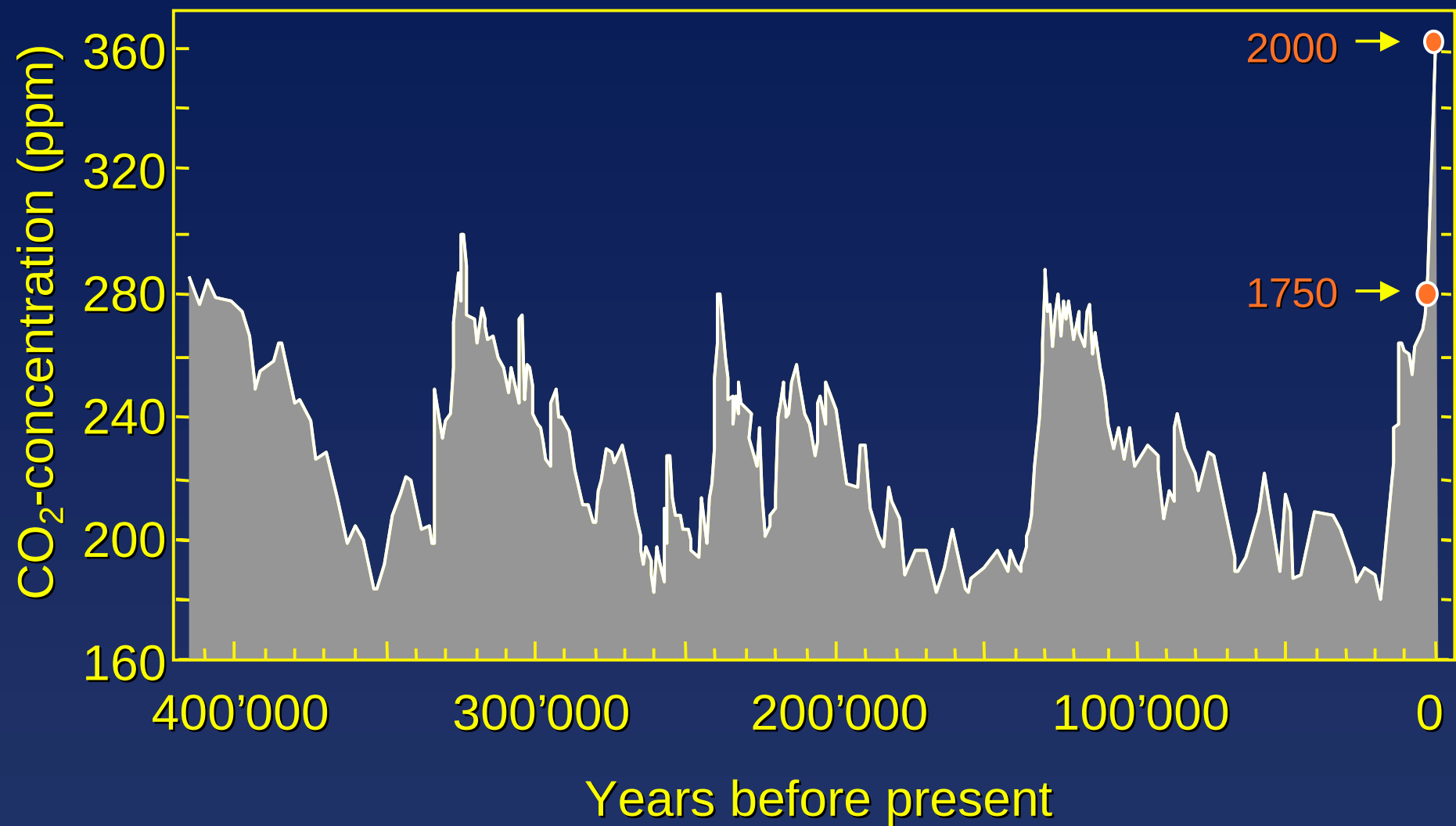
plants

animals

H
U
M
A
N
S

Land use

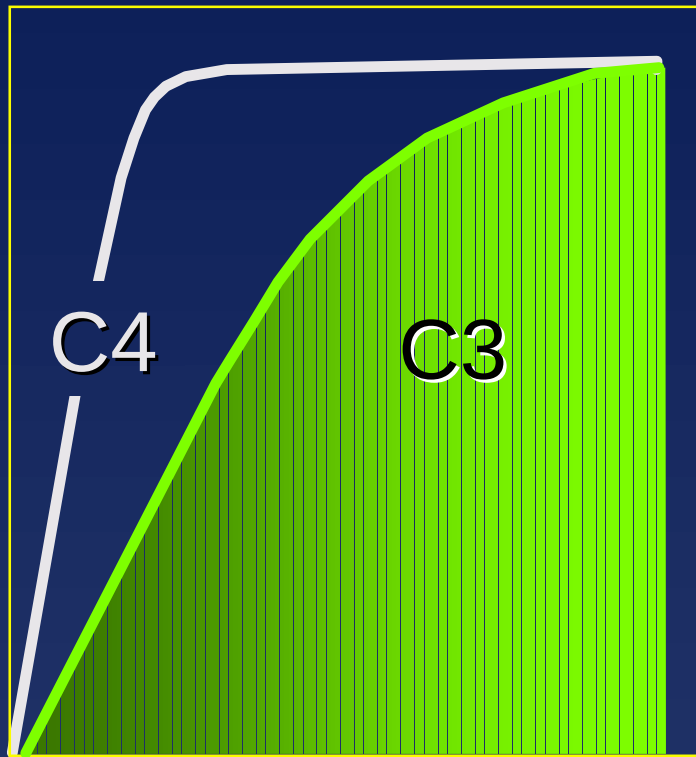
distruction of vegetation
soil conversion
soil losses (erosion)
invasions
ground sealing
fragmentation of habitats



Vostoc ice core data: Petit JR *et al.* (1999) Nature 399:429-436

Elevated CO_2

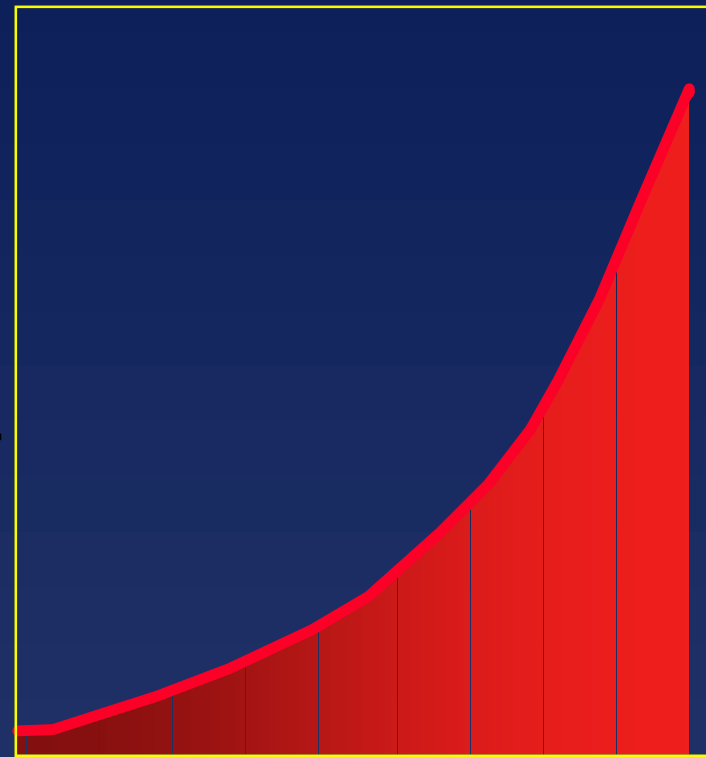
Assimilation



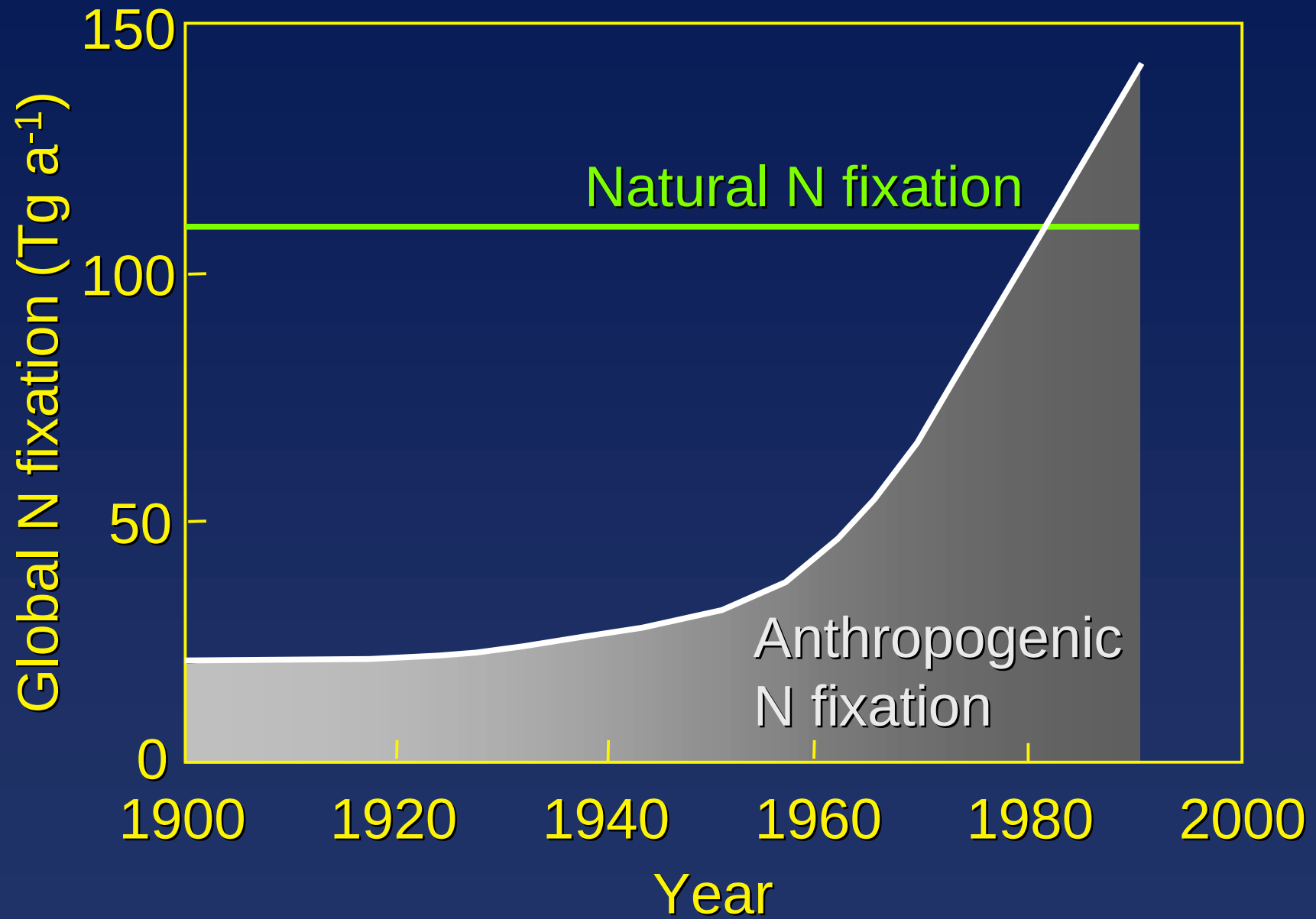
→ CO_2

Increased temperature

Respiration

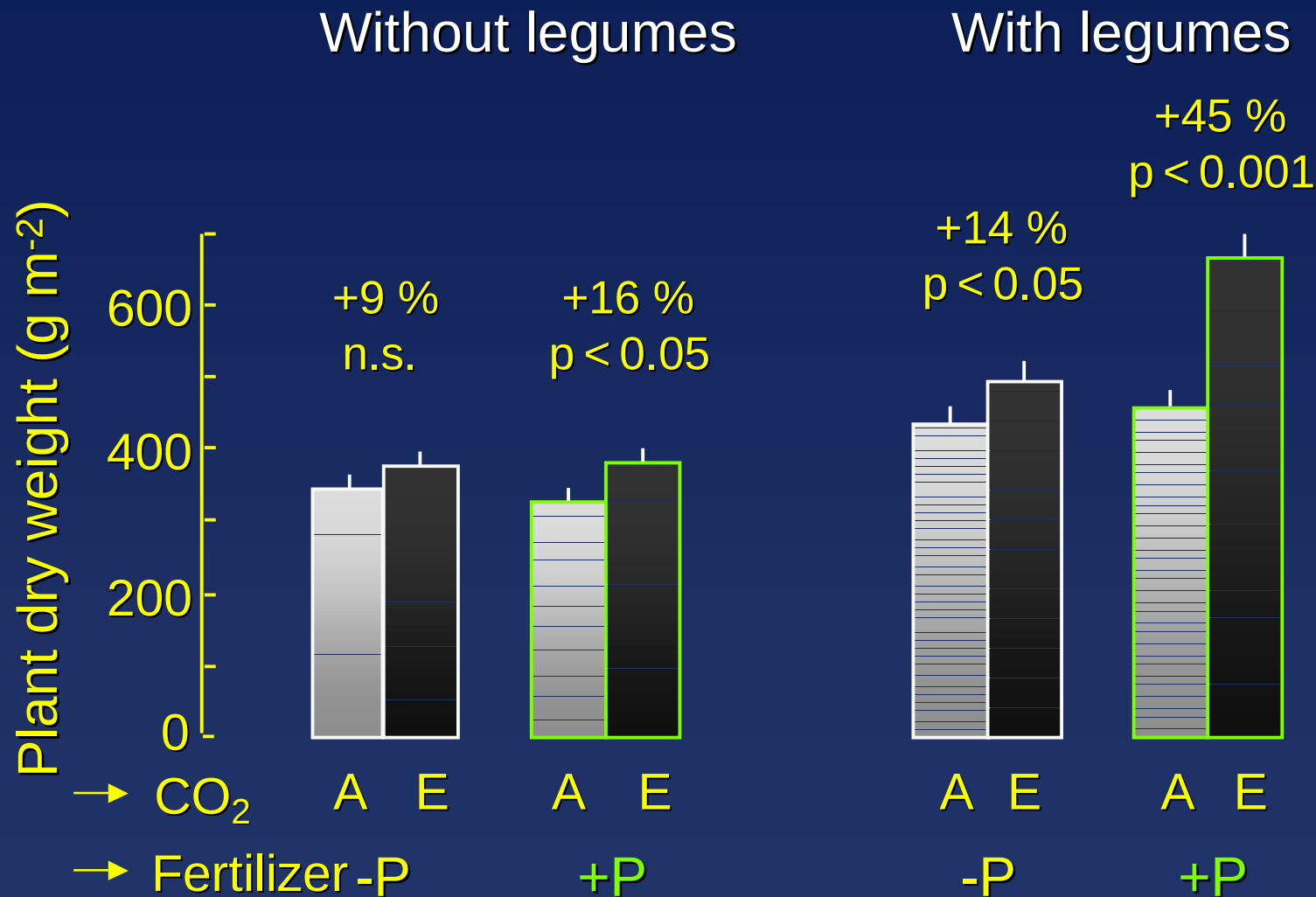


→ T



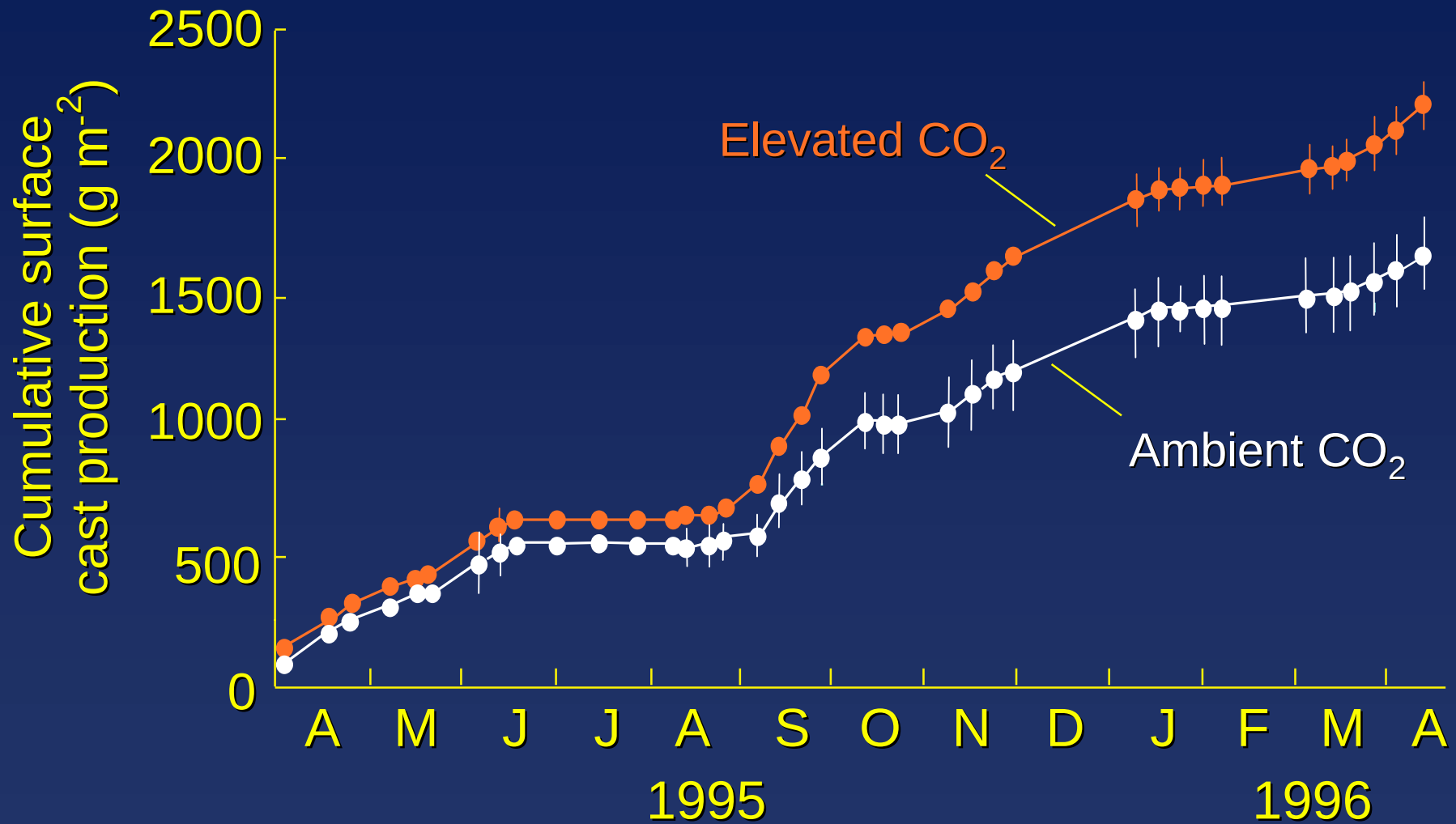
PM Vitousek (1994) Ecology 75:1861-76

Biomass responses of intact monoliths from calcareous grassland to elevated CO₂ and fertilization



J Stöcklin *et al.* (1998) *Oecologia* 116:50-56

Earthworm activity in elevated CO₂, calcareous grassland, Switzerland



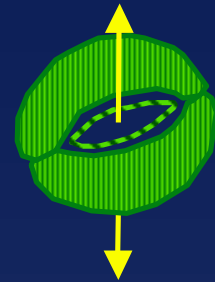
JG Zaller, JA Arnone III (1997) *Oecologia* **111**:249

A chain reaction due to CO₂-enrichment

1

Less transpiration

More photosynthesis



← CO₂ →



2

Soil moisture
less depleted

Soil carbon
input enhanced

3

More C-turnover

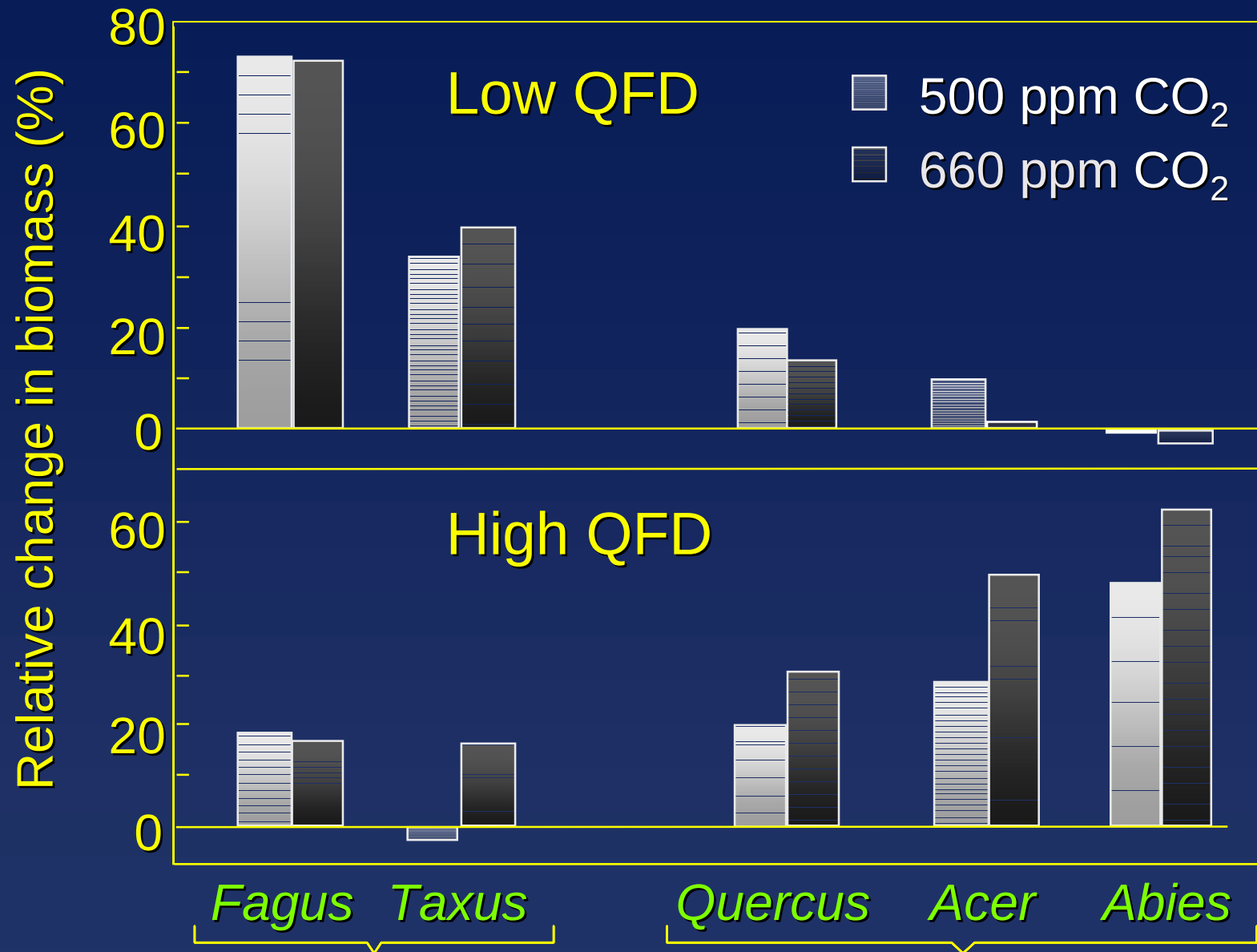
4

30% more earthworm activity: + (22 vs of 16 t ha⁻¹)

5

2 x N₂O emission

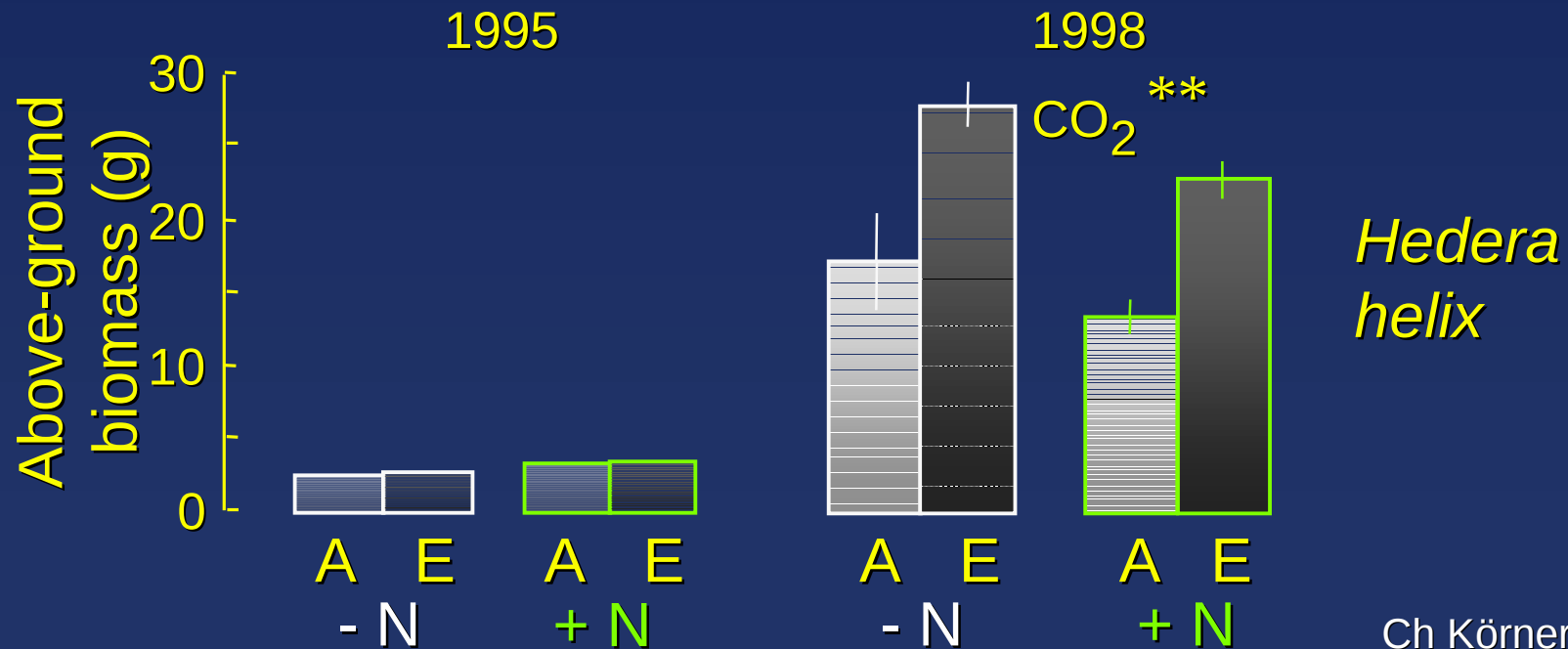
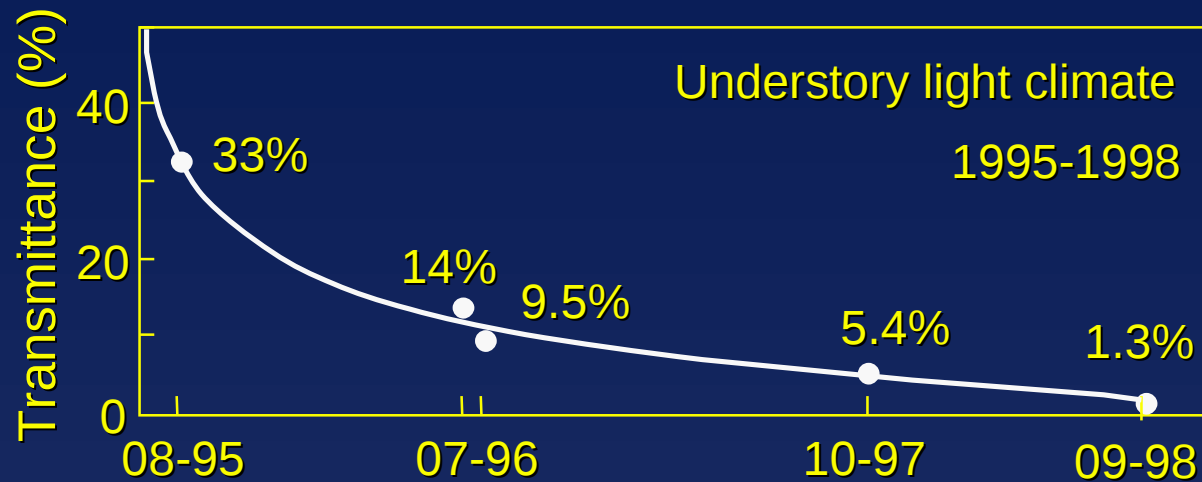
Wet, cold weather



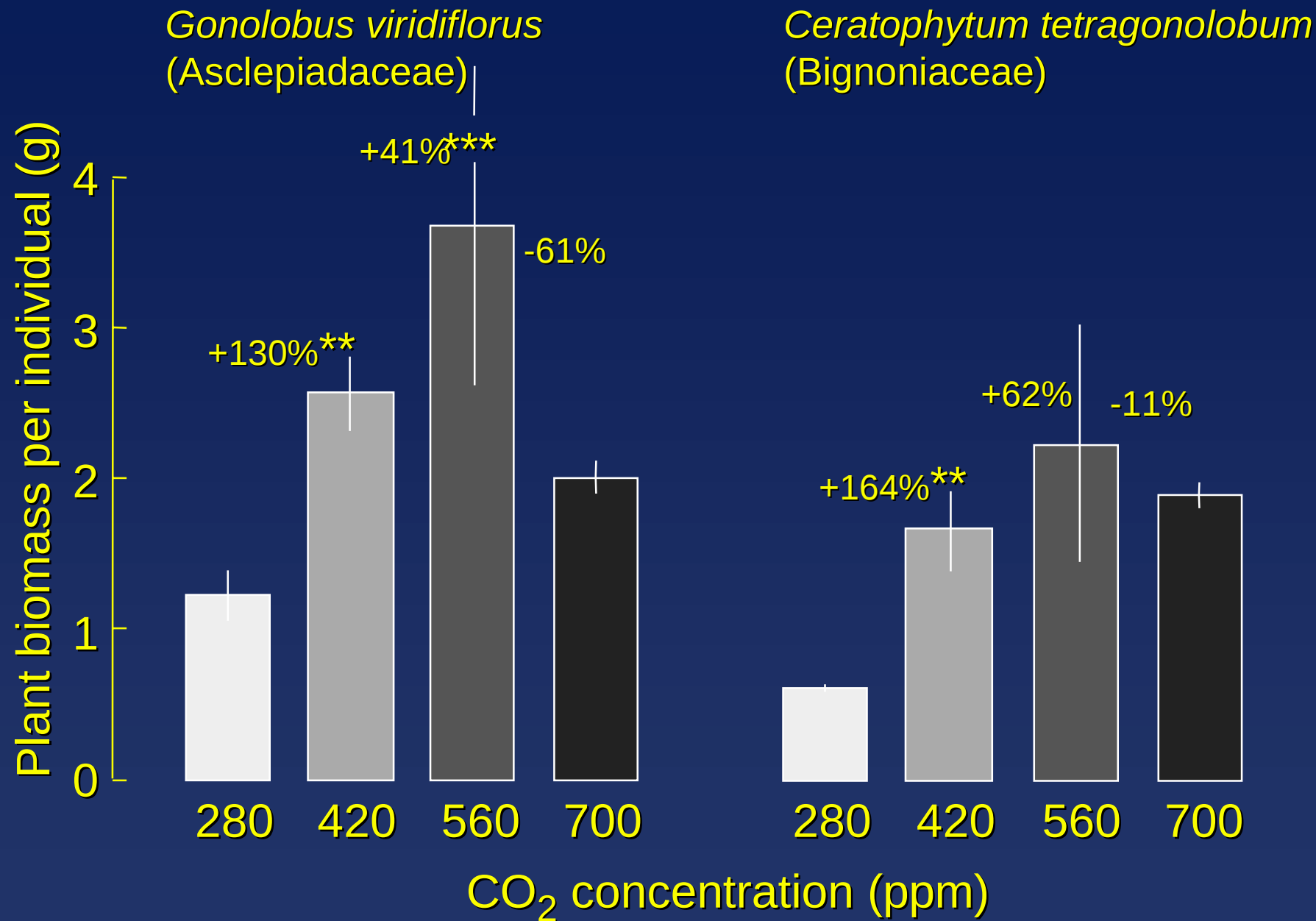
deep-shade tolerant species

less shade-tolerant species

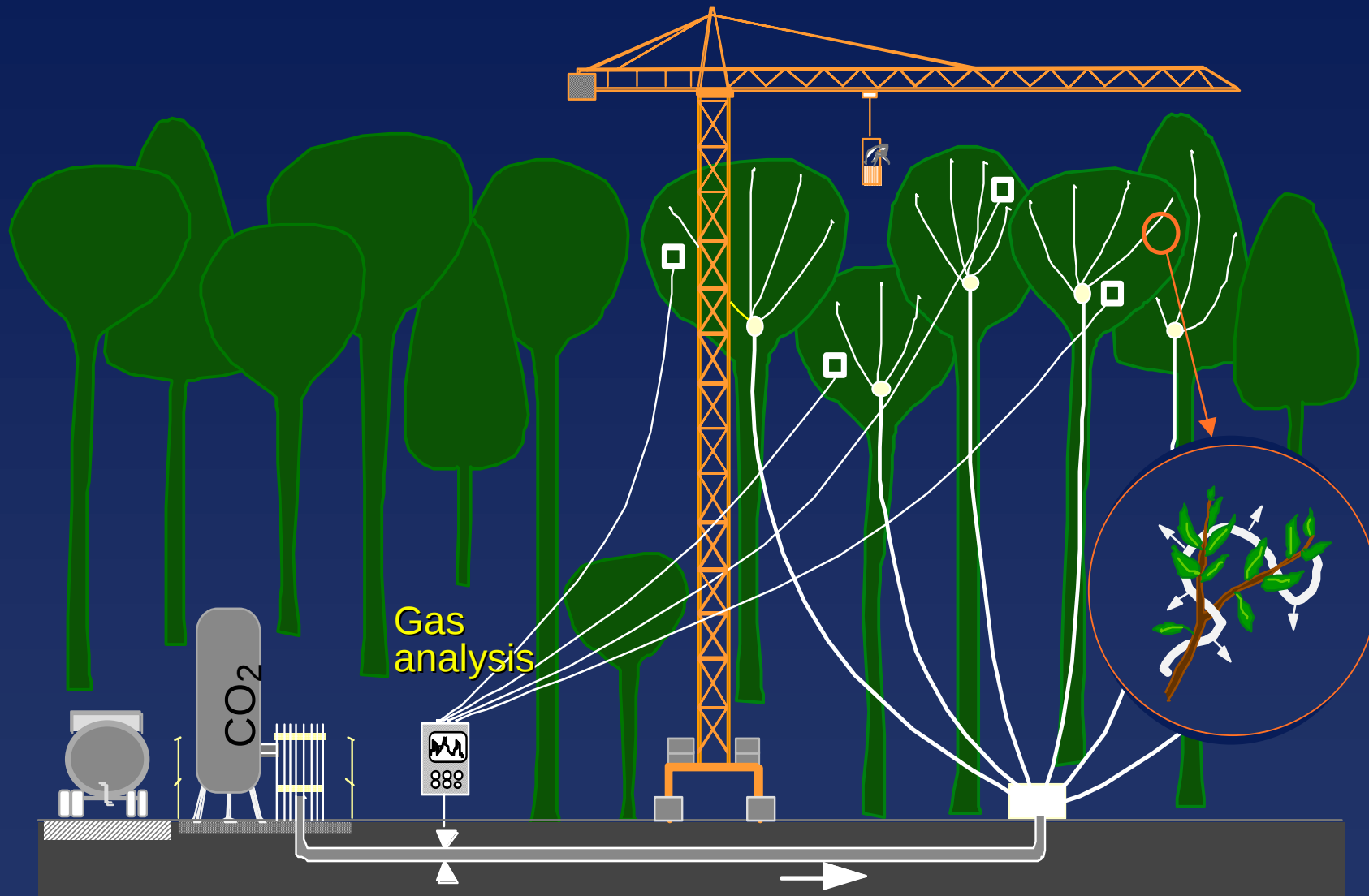
Understory response in beech-spruce model ecosystems on acidic soil



Ch Körner (2003)

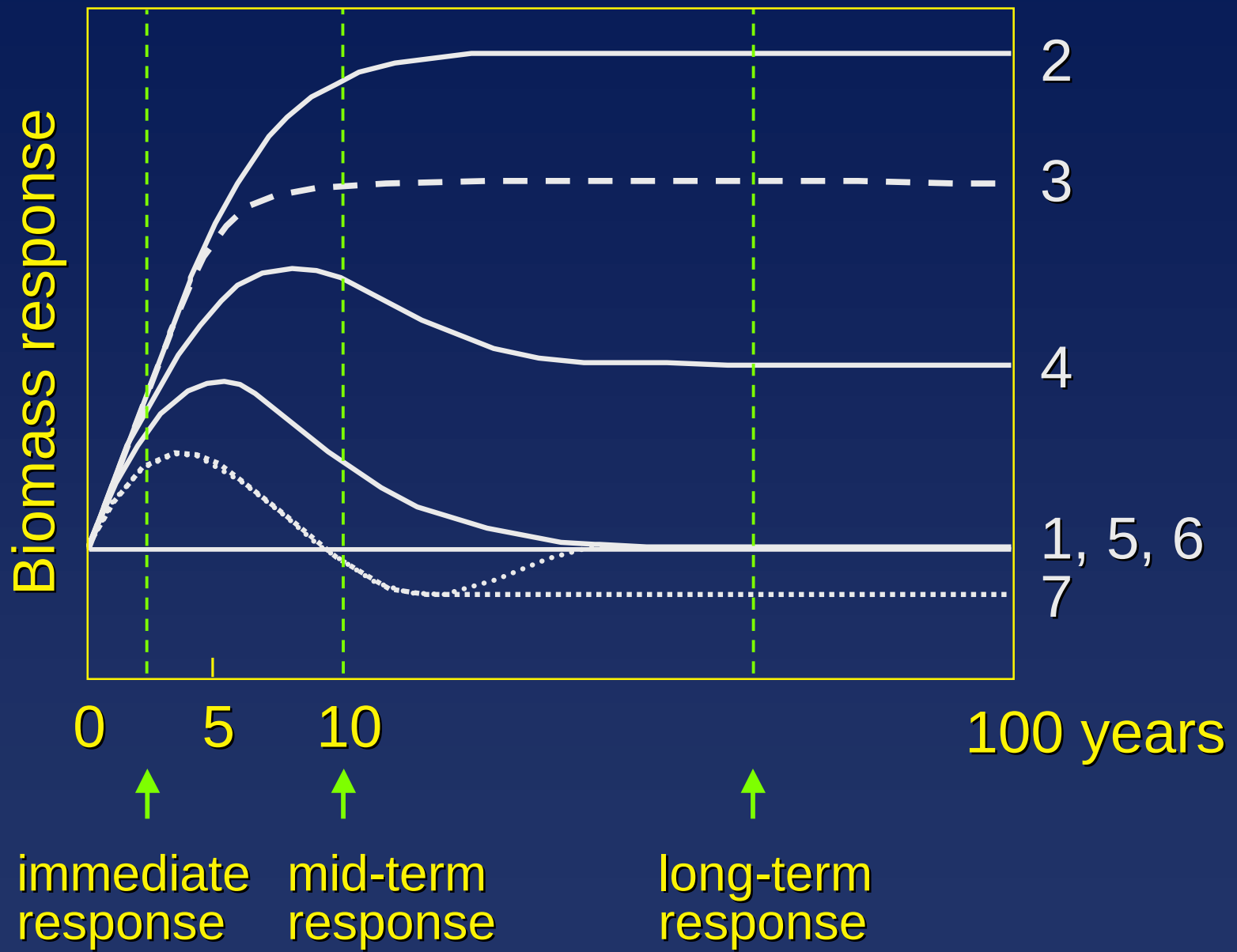


Swiss Canopy Crane Project



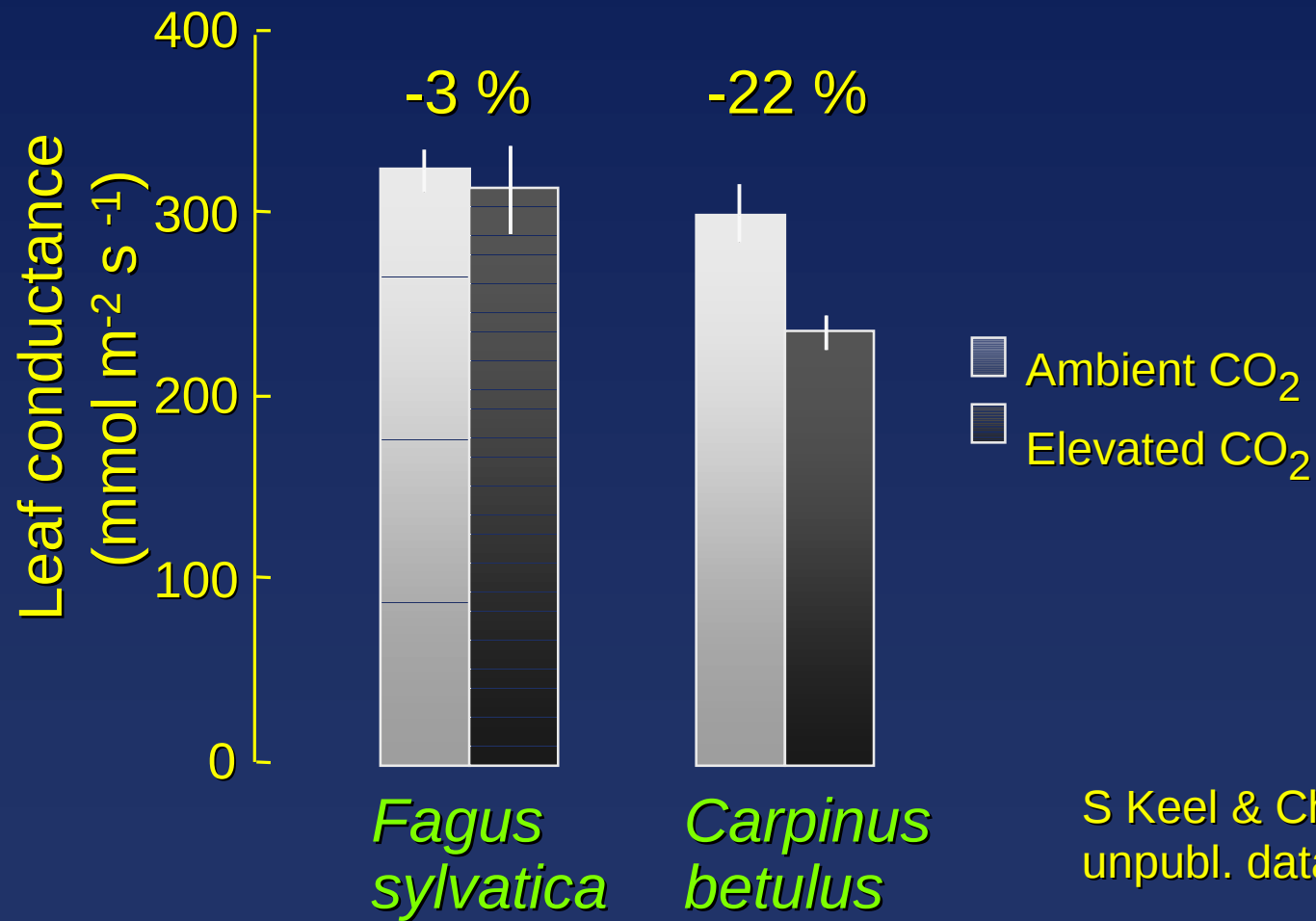
Gas control

Ch Körner



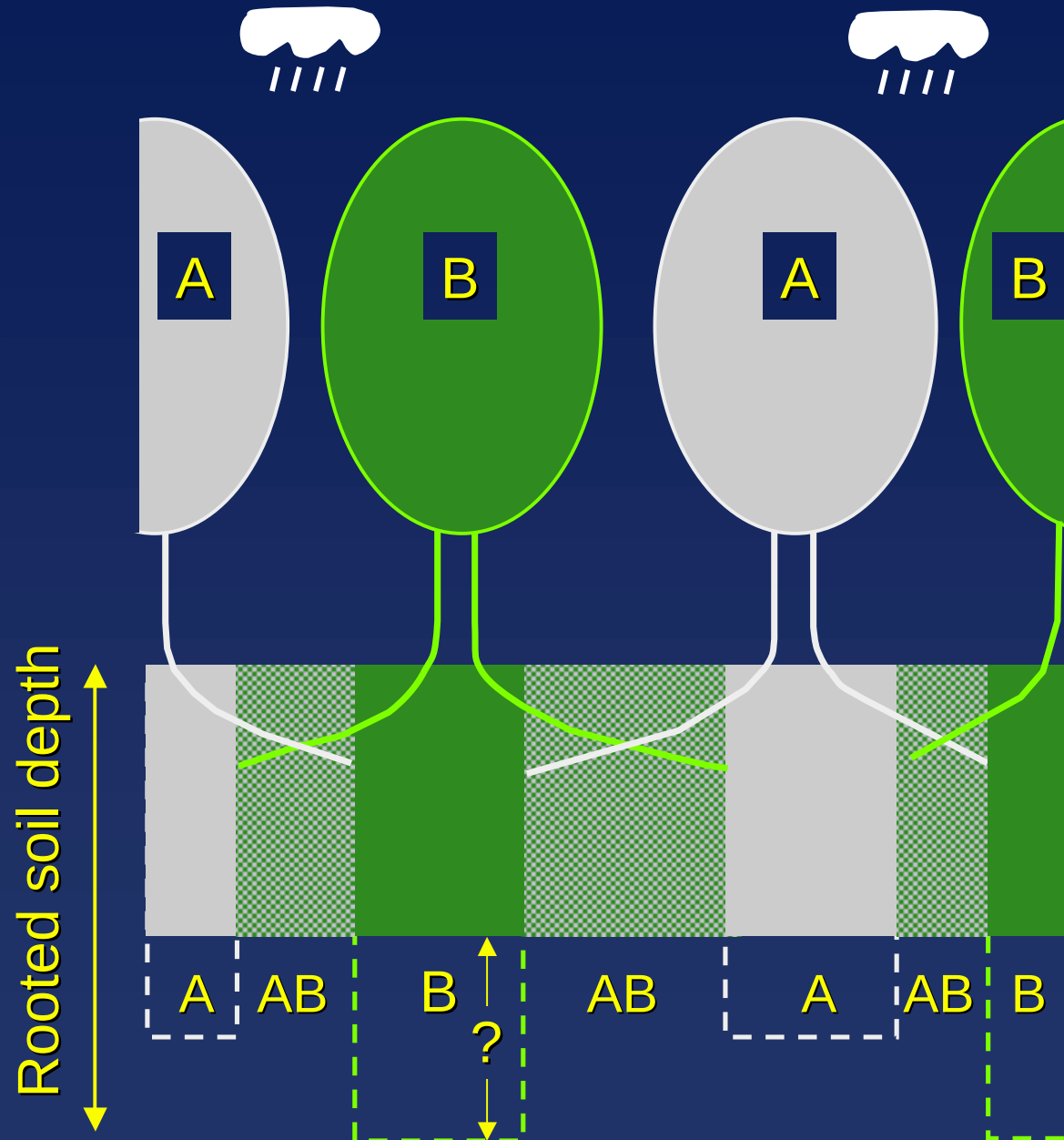
Mature forest trees under web-FACE (Basel)

CO₂ effect: $p = 0.07$ across species
(n.s. at species level)

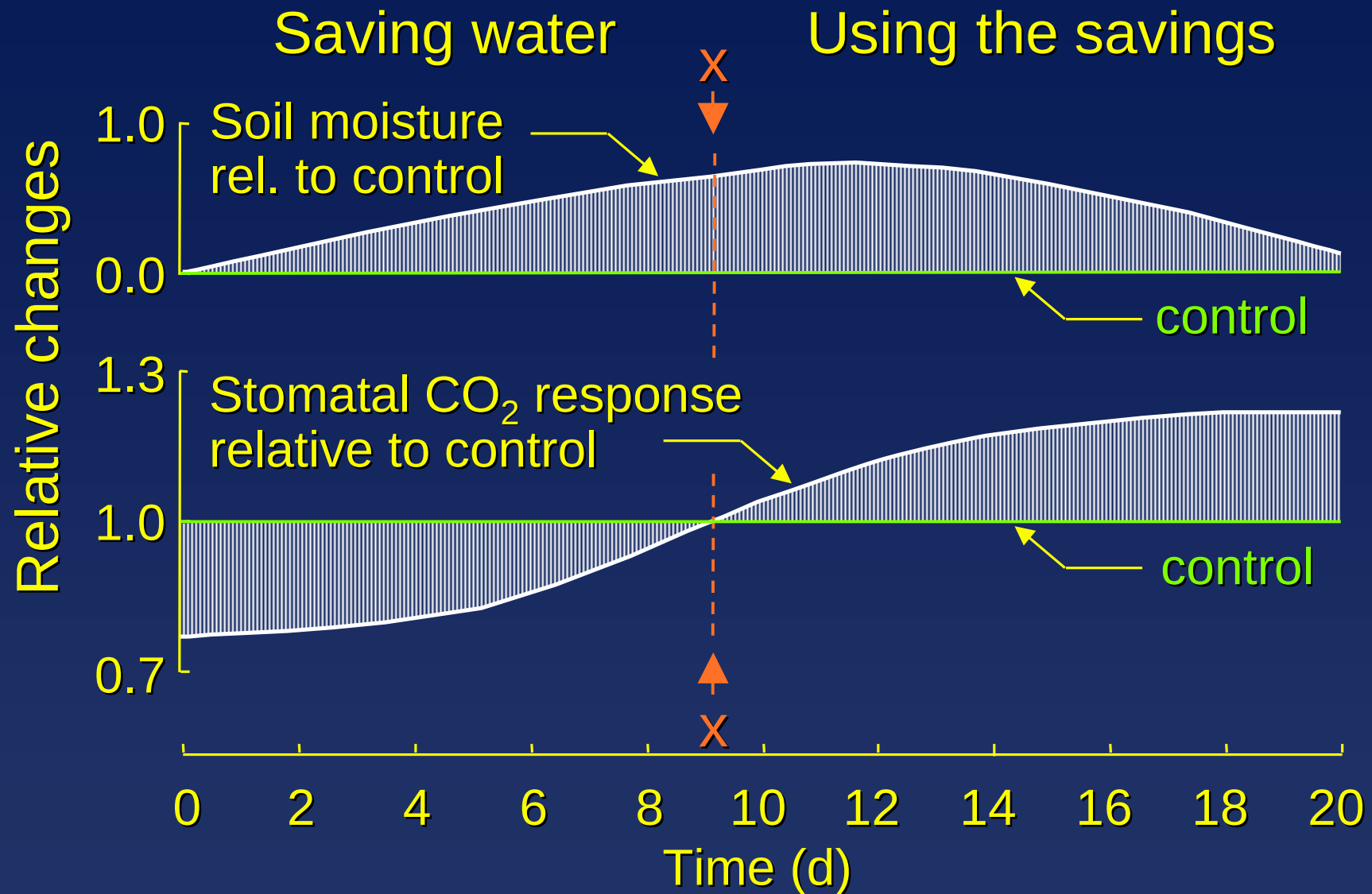


20 mm every 10 d

4 mm every 2 d



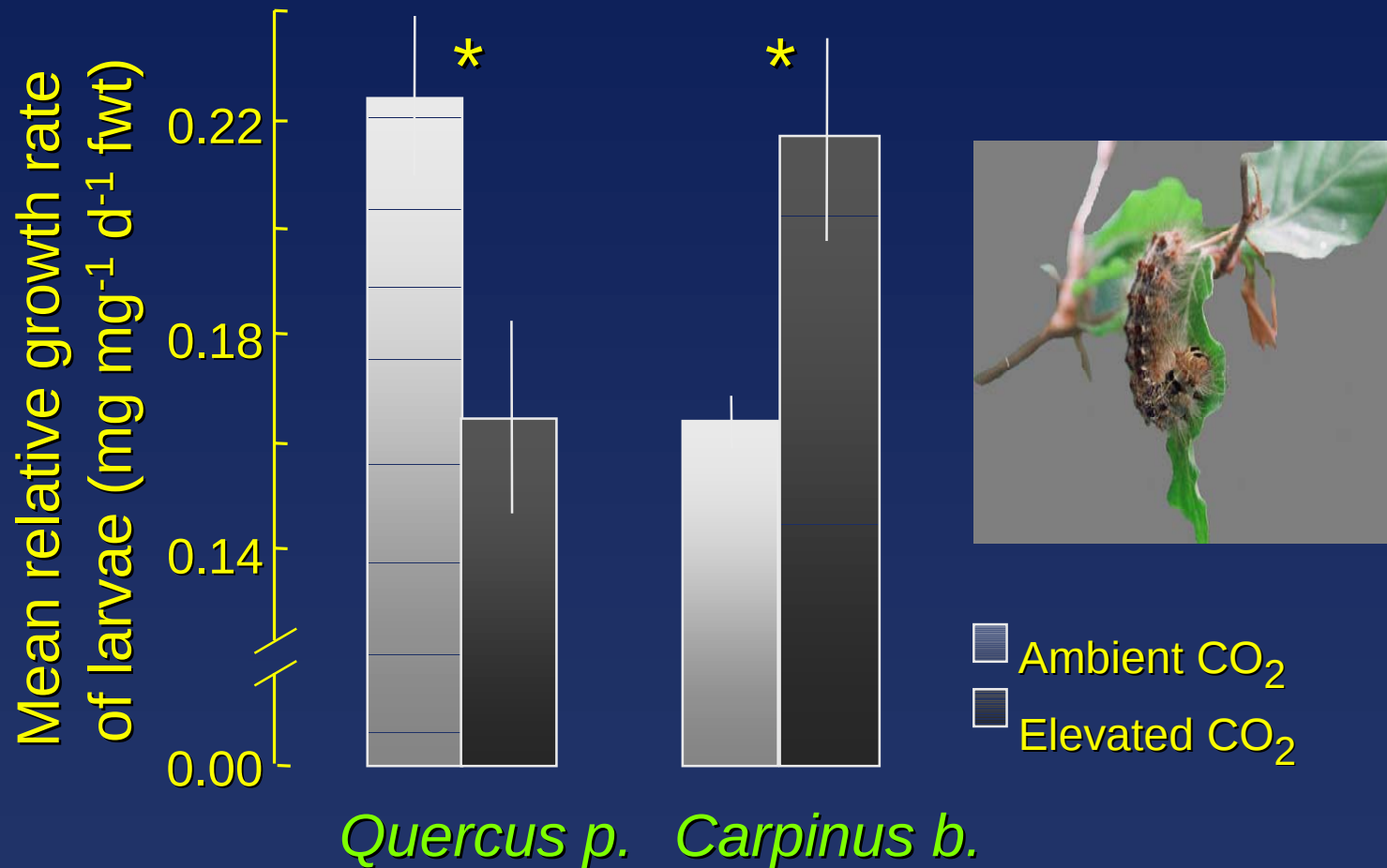
A: -5 % Transp.
B: -30 % Transp.



Beyond time 'x' positive effects of water savings on stomata overrun direct negative CO₂ effects on stomata.

Growth of *Lymantria dispar* larvae feeding on adult forest trees exposed to elevated CO₂

n = 8 branches $\pm$ SE (each branch with 5 larvae)



Hättenschwiler S & Schafellner C (June 2002) unpubl. data

Fungal isotope signal under CO₂-enriched forest trees (Oct. 2001)

