The genetic variability of Common reed -

Ecophysiological aspects in a present and future perspective

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Phragmites australis diversity

- cosmopolitan species, from tropical to temperate climates
- highly diverse: several ploidy levels, many genotypes
- diverse morphology and physiology

Common garden at Aarhus University; “Påskehøjgaard”

European *P. australis* group

Map: C. Lambertini

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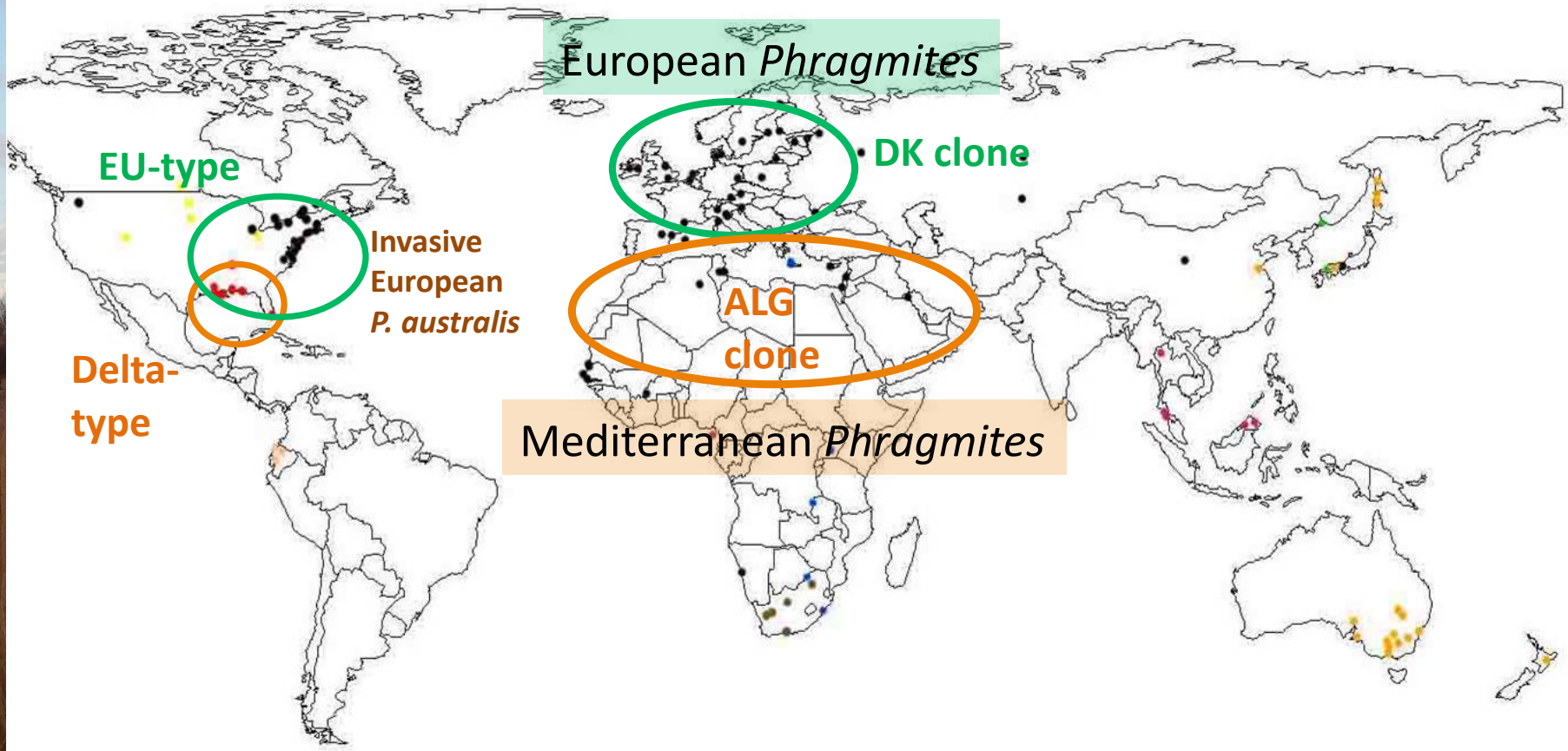
European *P. australis* group



Map: C. Lambertini

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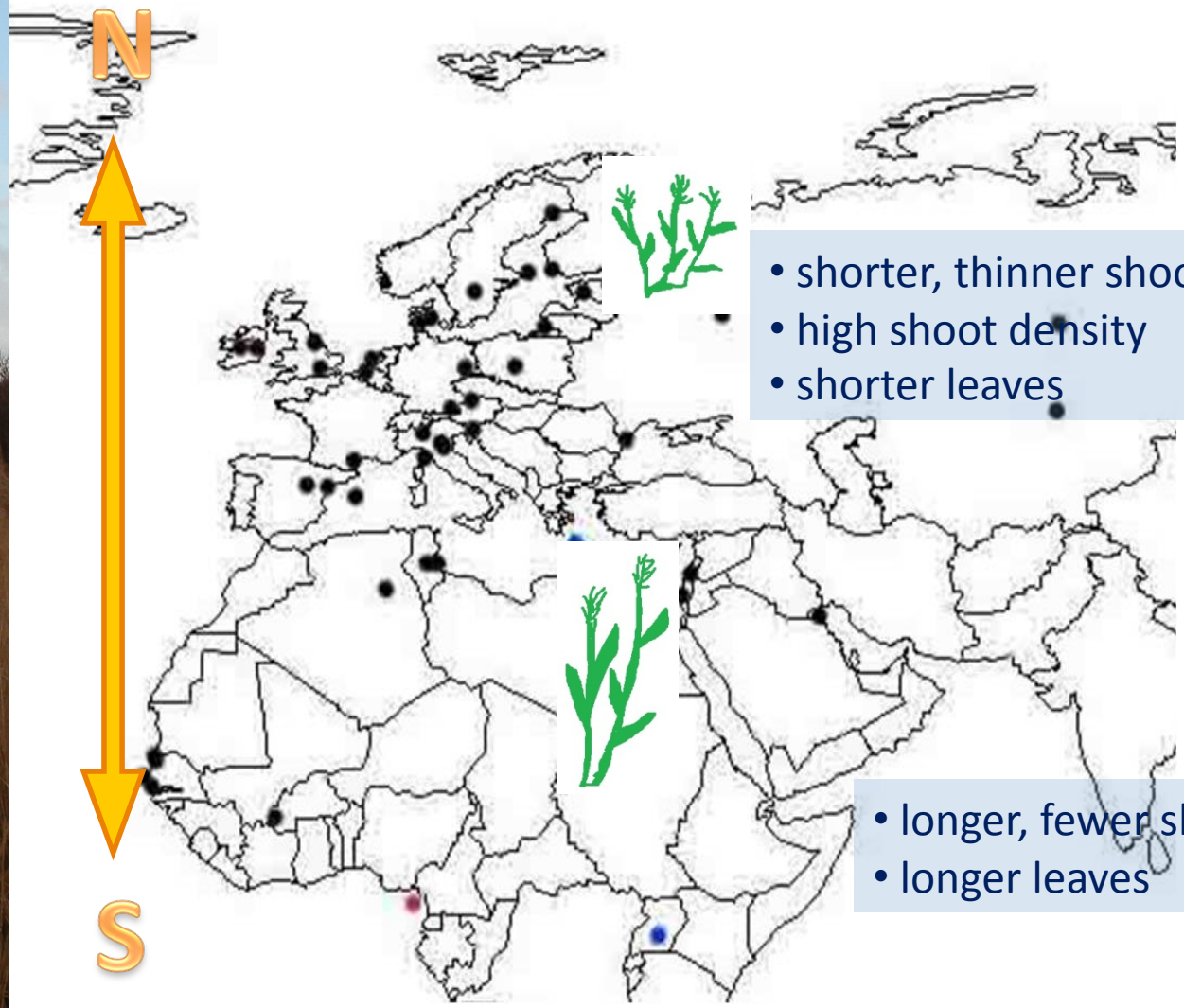
Clinal variation: continuous gradient of phenotypic differences over a geographic area



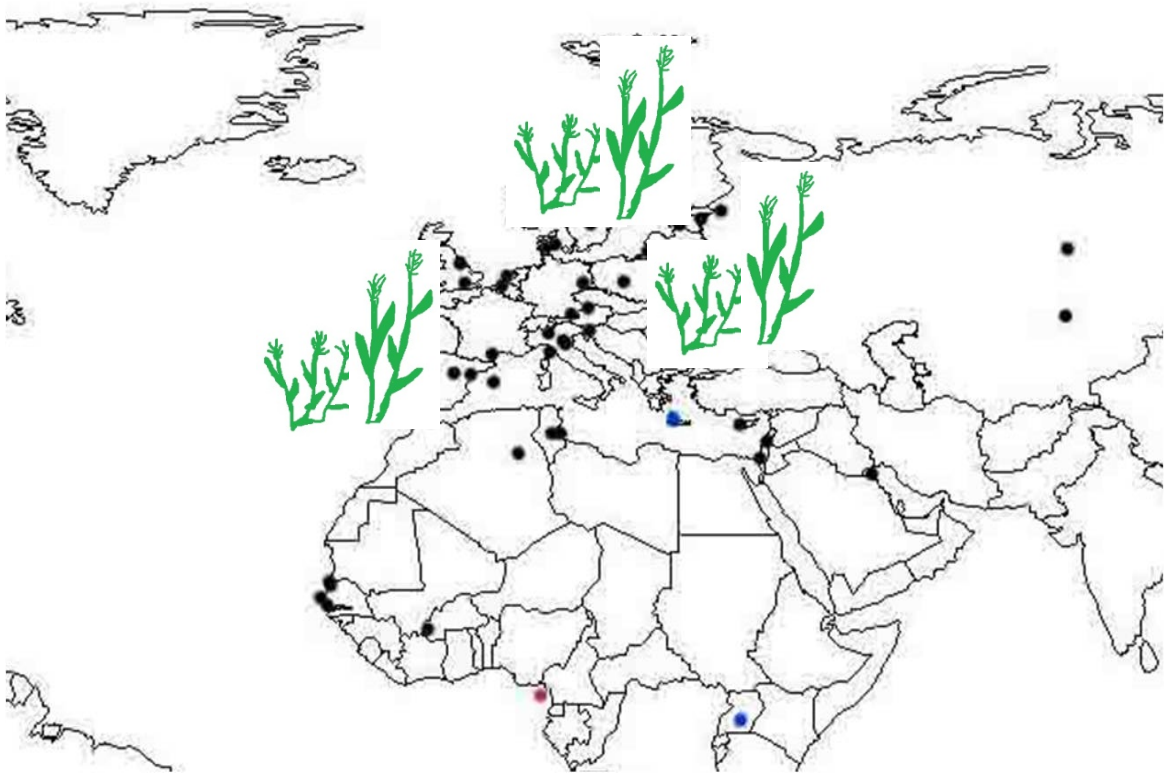
- shorter, thinner shoots
- high shoot density
- shorter leaves

- longer, fewer shoots
- longer leaves

Genetically determined differences

- similar growth & morphology even in different environment
- physiological processes: high plasticity!
- genetic adaptation to climate of geographical origin

→ length of growing season, light conditions



Hansen *et al.* 2007
Clevering *et al.* 2001
Lessmann *et al.* 2001

Climate change

CO_2
Temperature ↑

Anthropogenic impact: eutrophication
increased salinity

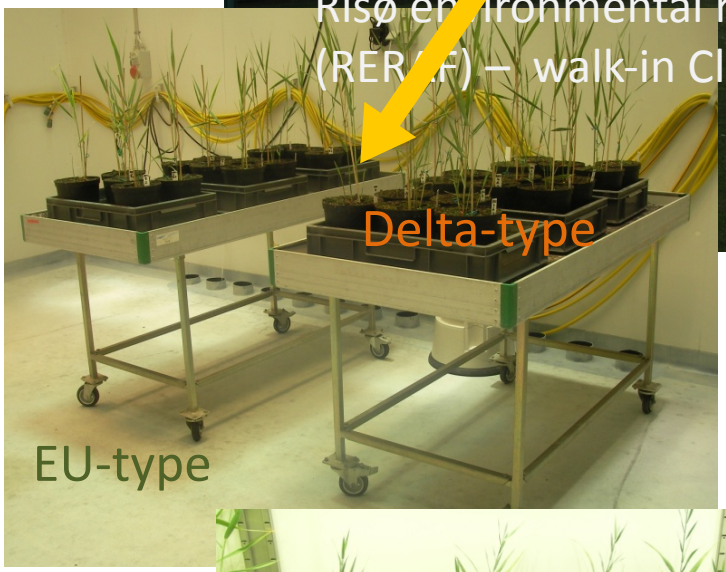
How do genotypes of *P. australis* from distinct origins respond to climate change?

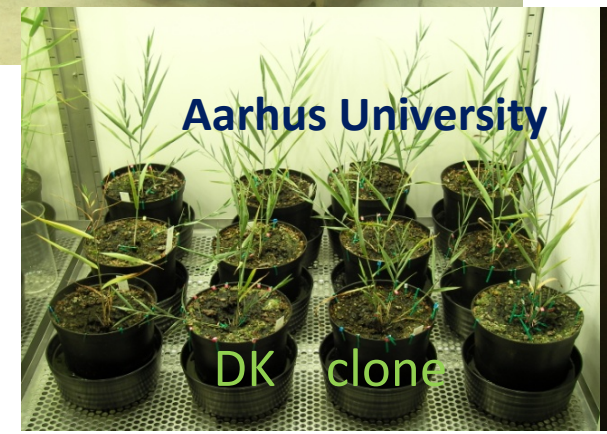
EU-type
Delta-type

DK clone
ALG clone

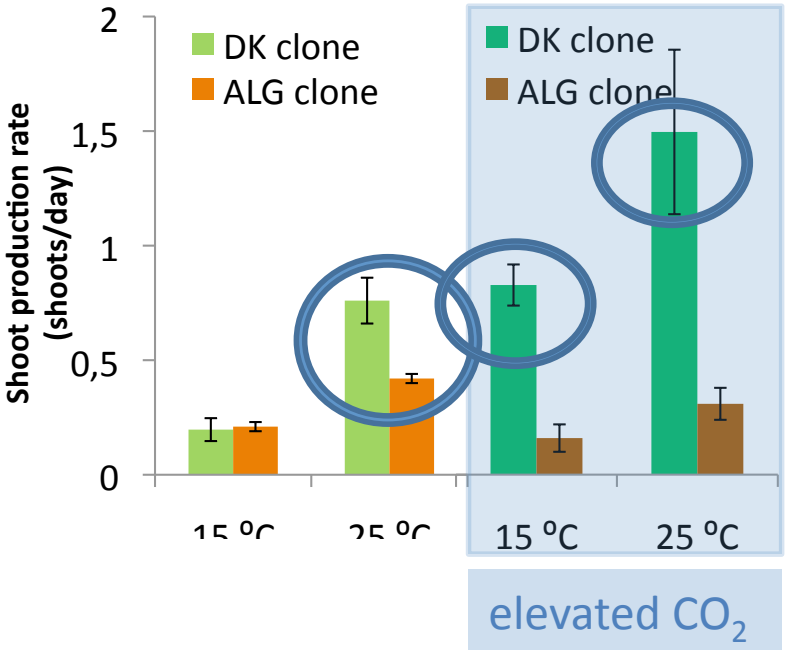
Growth chamber experiments

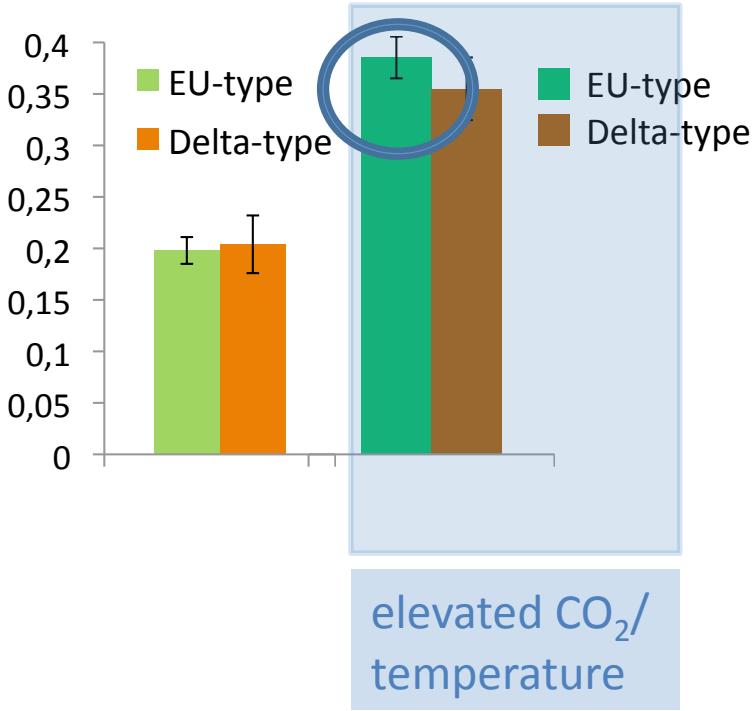
nutrients
salinity



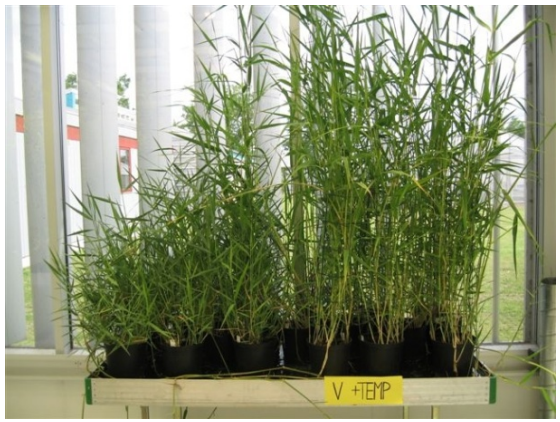


Shoot production

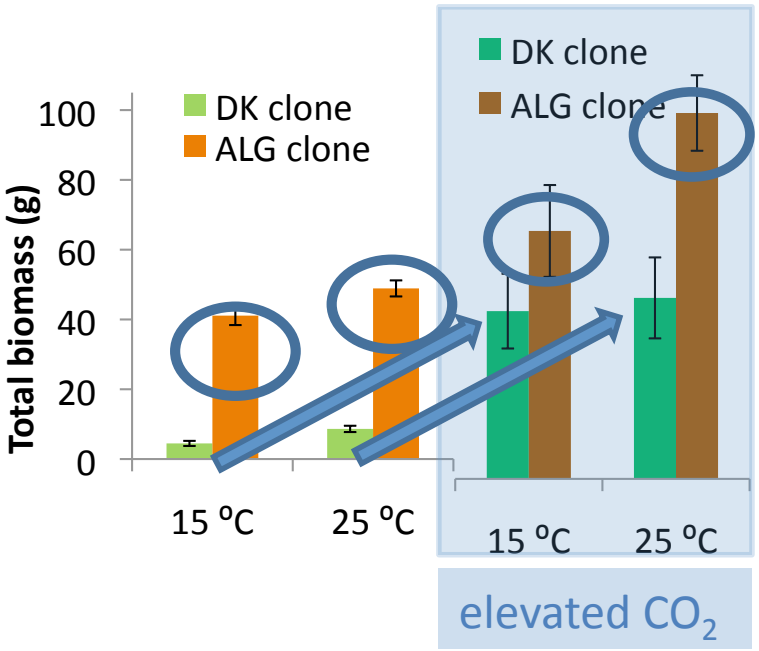


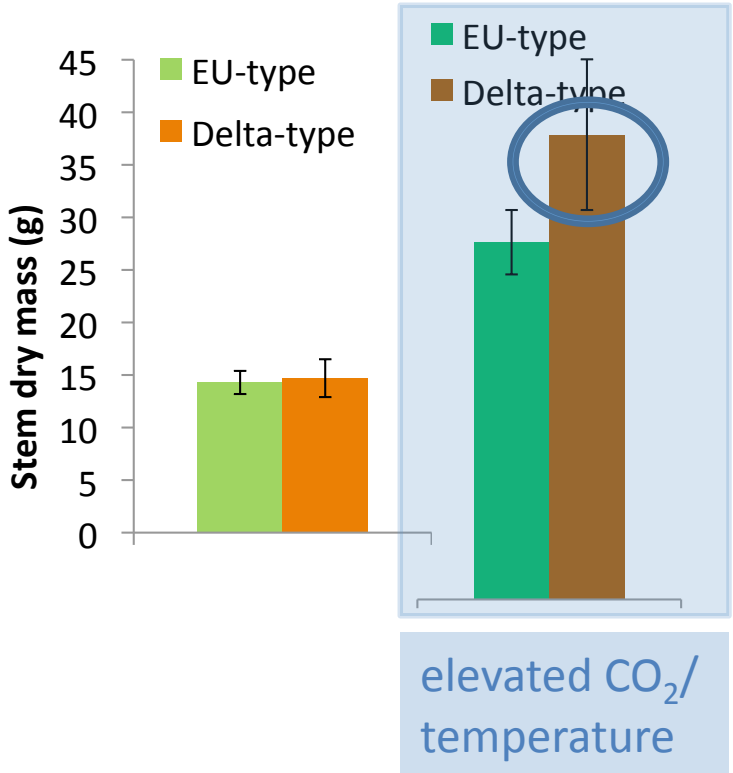


- temperature is important
- European *Phragmites* is mostly stimulated by elevated CO_2/temperature



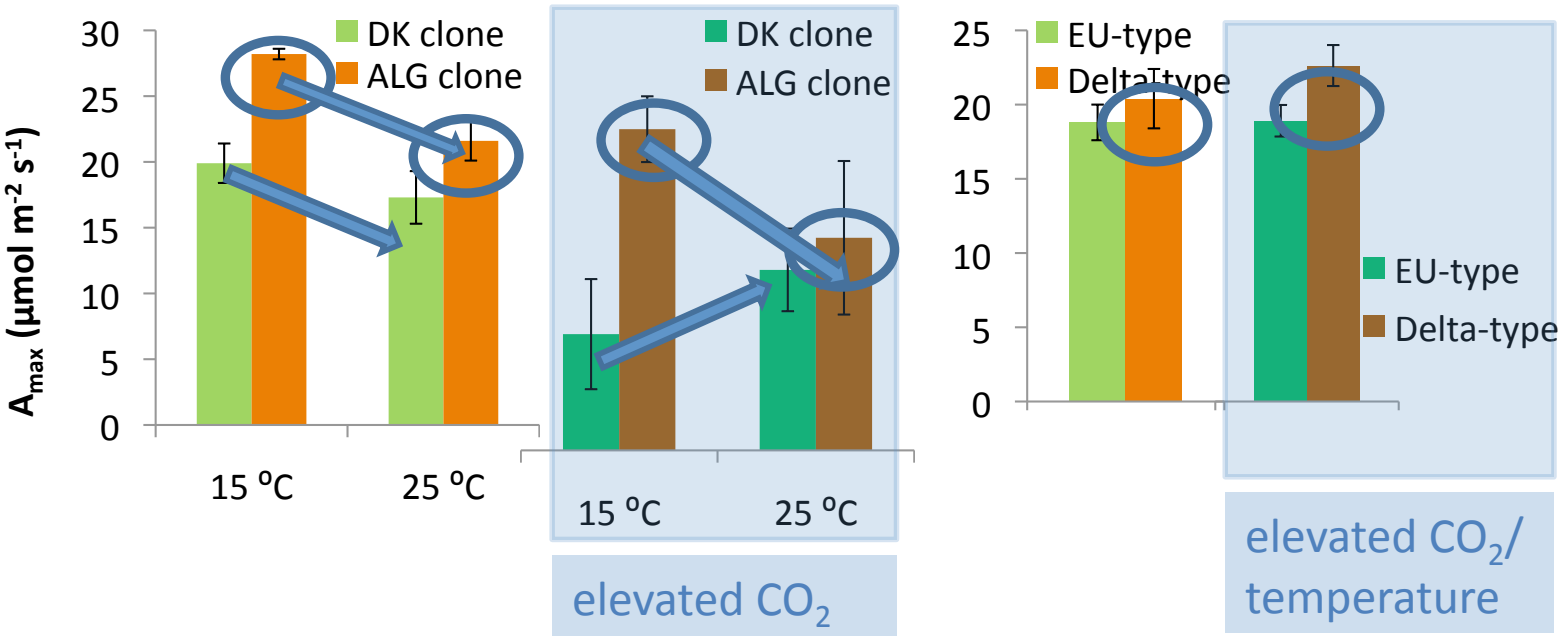
Biomass





- Mediterranean *Phragmites* has higher biomass especially under elevated CO_2/temperature
- European *Phragmites* responds relatively more to elevated CO_2

Photosynthesis



- Mediterranean *Phragmites* has higher A_{max} also under elevated CO_2
- responses to temperature differ under elevated CO_2

Interactions with nutrients

- elevated CO_2 changes the responses to temperature and nutrient availability

→ different magnitude of responses – different plasticity

Plasticity = phenotypic changes in response to environmental change

ambient CO_2 ⟷ elevated CO_2

DK clone temperature

equally plastic!

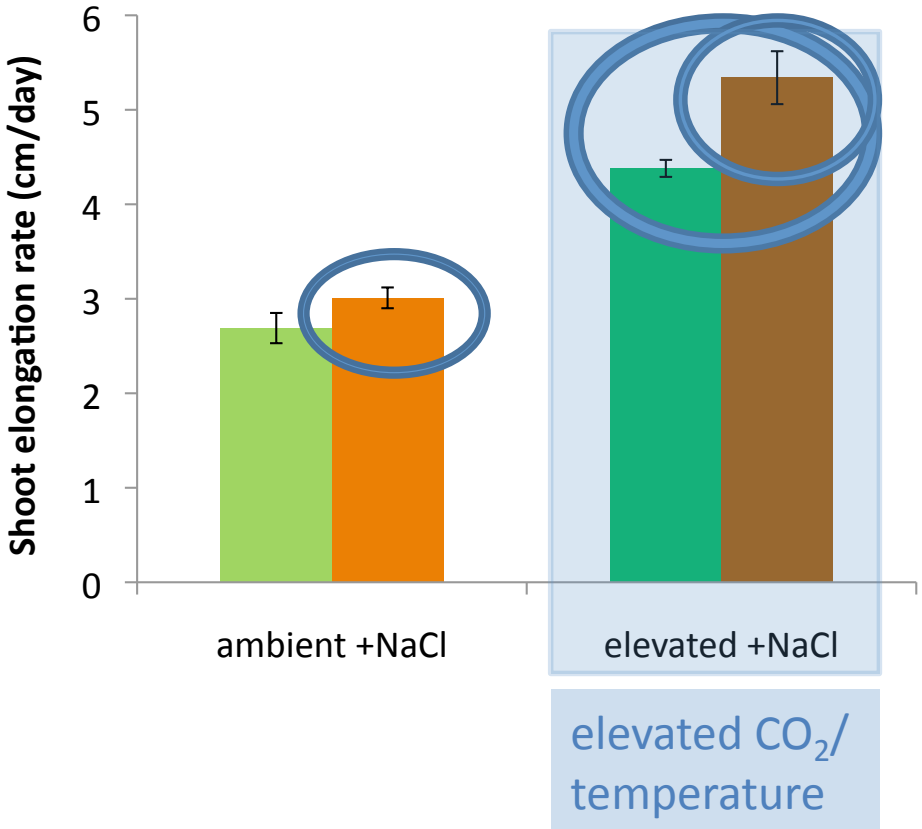
ALG clone

nutrient availability

temperature

Interactions with salinity

- elevated CO_2/temperature ameliorate salt stress
- Delta-type (Mediterranean *Phragmites*) is more salt-tolerant



EU-type

Delta-type

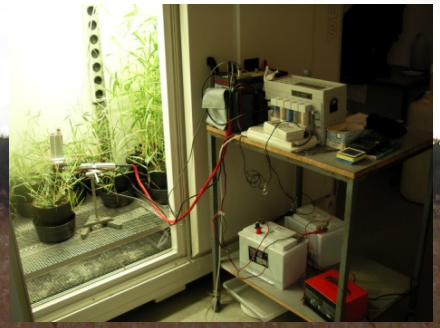
Summary & Conclusions

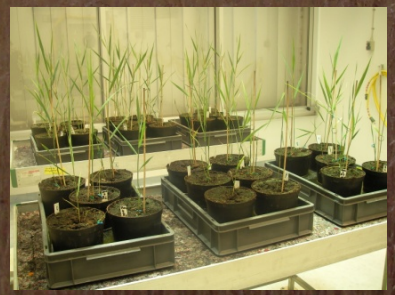
- Mediterranean *Phragmites*: more biomass, taller
  higher photosynthesis
- European *Phragmites*: higher shoot density
  higher plasticity
- unequal responses to climate change factors
- distinct interactions with abiotic factors under elevated CO_2

→ Ecological adaptations to the climate of origin determine *P. australis* responses to climate factors

→Abundance of different genotypes and composition in the field may be changed

Thank you for your attention!





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