

CLIMATE WARMING IN EXPERIMENTAL GRASSLANDS OF DIFFERENT SPECIES RICHNESS LEVELS



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EXPERIMENTAL SET-UP



288 experimental grassland communities with 1, 3 or 9 species (S)



12 climatized chambers (T_{air} or $T_{air} + 3\text{ }^{\circ}\text{C}$), equal precipitation



Biomass

Community scale measurements



CO₂ exchange



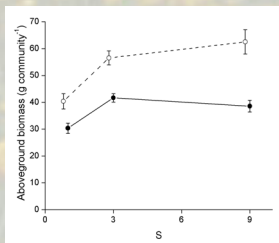
Water relations

RESULTS

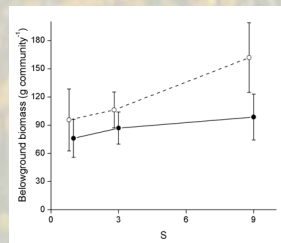
Data from communities with different species richness levels (S), at ambient temperatures (○) and ambient temperatures + 3 °C (●)

Biomass production (2003-2005)

Aboveground

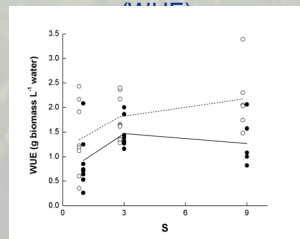
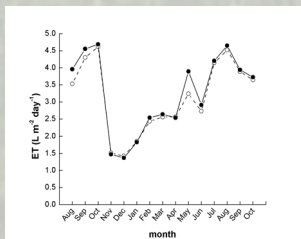


Belowground



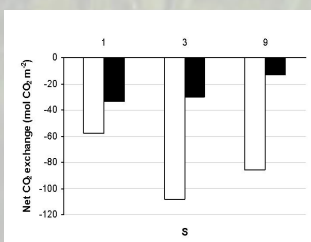
Water relations (2003-2004)

Evapotranspiration (ET) Water Use Efficiency (WUE)

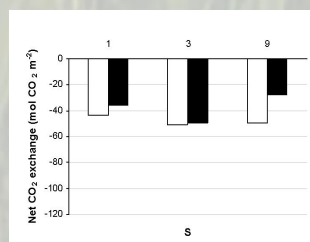


CO₂ exchange

2003-2004



2004-2005



CONCLUSIONS

(1) Warming:

- Lowered biomass production by 29% aboveground and by 25% belowground
- Increased ET initially, until a new equilibrium was reached, resulting in dryer soils
- Caused less efficient water use
- Resulted in a decreased net CO₂ uptake (decreased sink capacity) in the short term
- These adverse effects were likely caused by higher and more frequent heat and drought stress

(2) Species richness:

- Biomass production and WUE generally increased with rising S, because of higher (spatial) complementarity
- No clear trends in net CO₂ uptake

(3) Interactions:

- Biggest differences between heated and unheated communities at S = 9
- Consistently observed in biomass production, WUE and net CO₂ uptake
- Opposite to what was expected under the "insurance hypothesis"
- Possibly related to increased competition in multi-species communities under high abiotic stress

(4) Future studies:

Important to study multiple global changes simultaneously as single effects are not always additive

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