Photosynthetic activity of C_3 and C_4 graminoids in response to inundation in a shrot-hydroperiod wetland

Junbin Zhao

Florida International University

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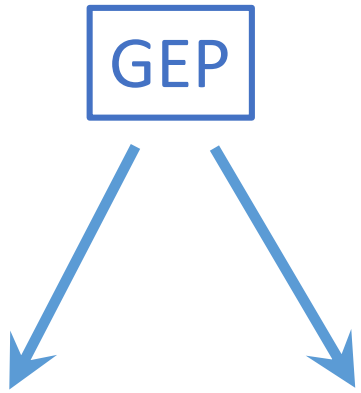
Story starts from …



Leaf area

√

Photosynthetic rate

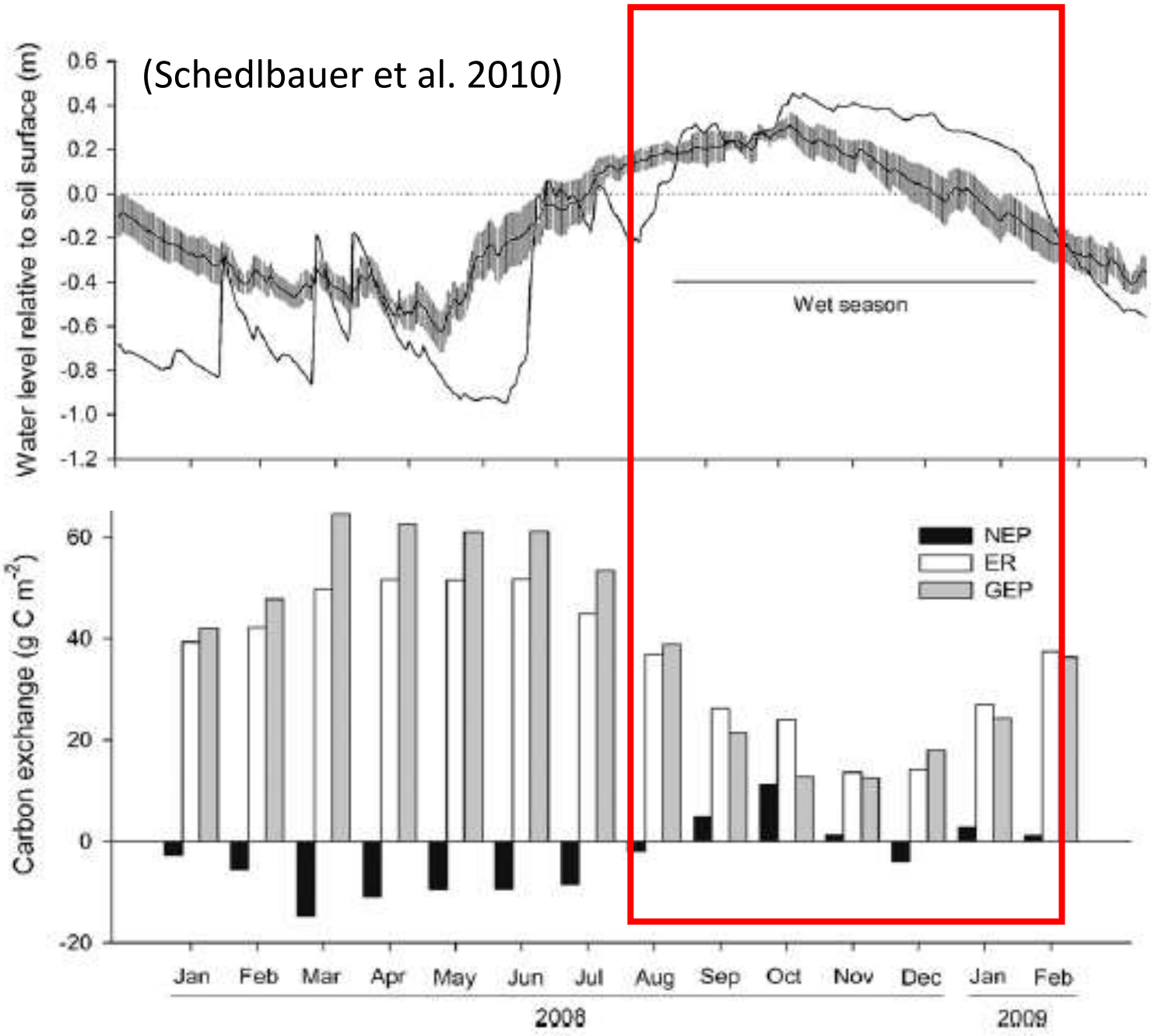
?

GEP: gross ecosystem production, CO2 uptake

ER: ecosystem respiration, CO2 release

NEP: net ecosystem production, net CO2 exchange

(Schedlbauer et al. 2010)



Hypothesis

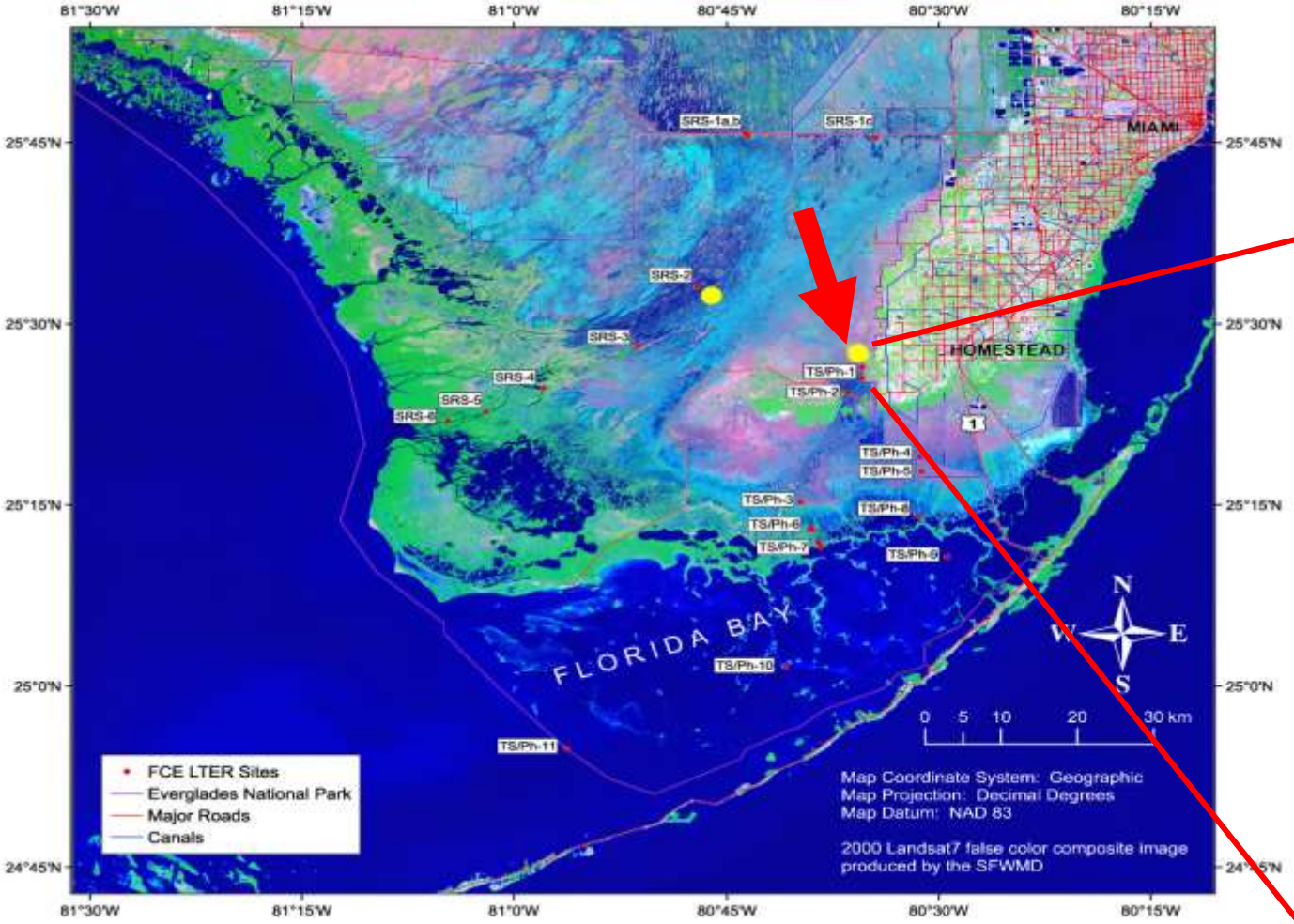
Inundation

Stomatal closure

Reduce photosynthesis

Location

Levee **~30cm** higher than marsh



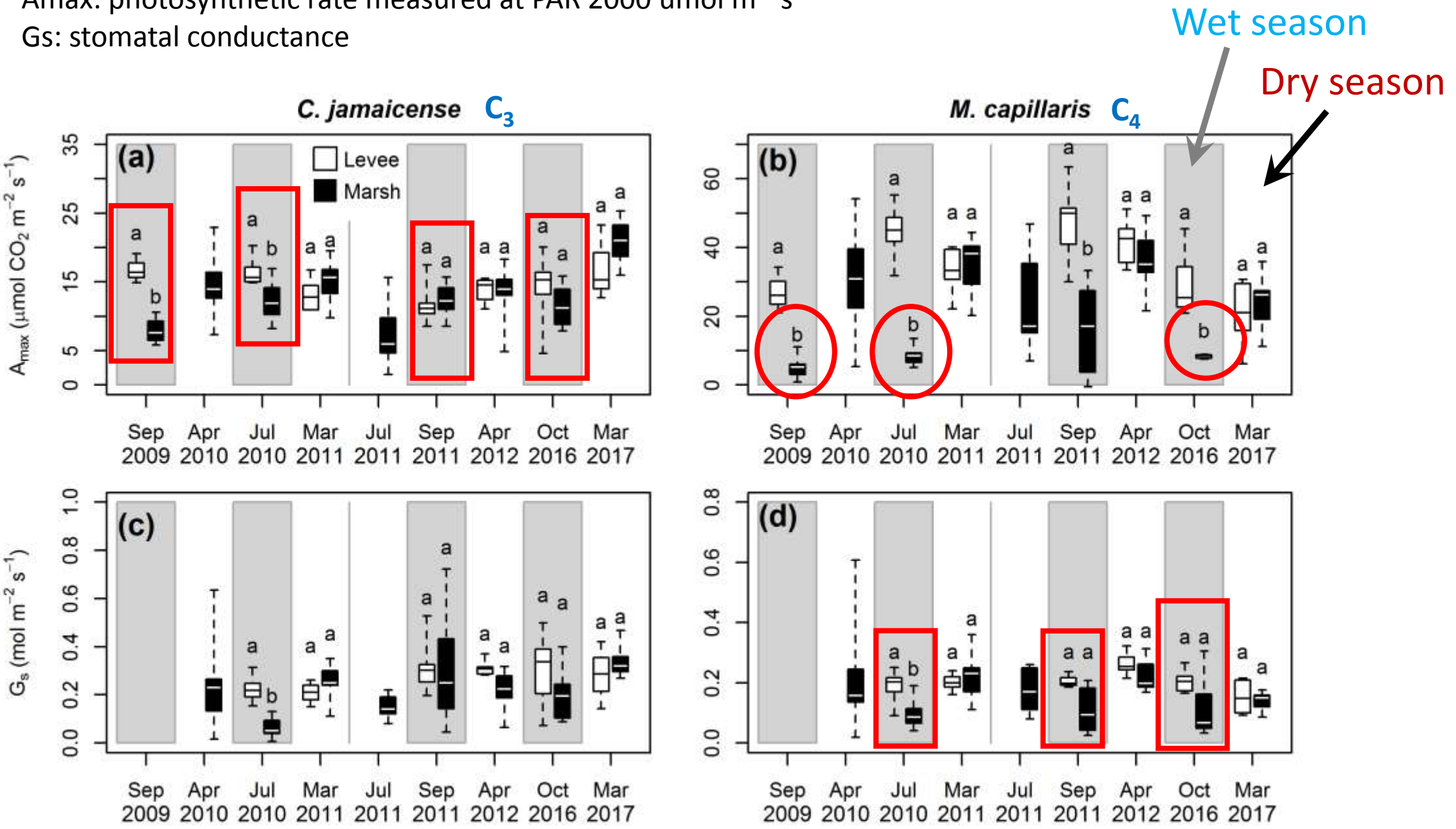
Dominant species

Saw grass (*Cladium jamaicense,* C_3)

Muhly grass (*Muhlenbergia capillaris,* C_4)

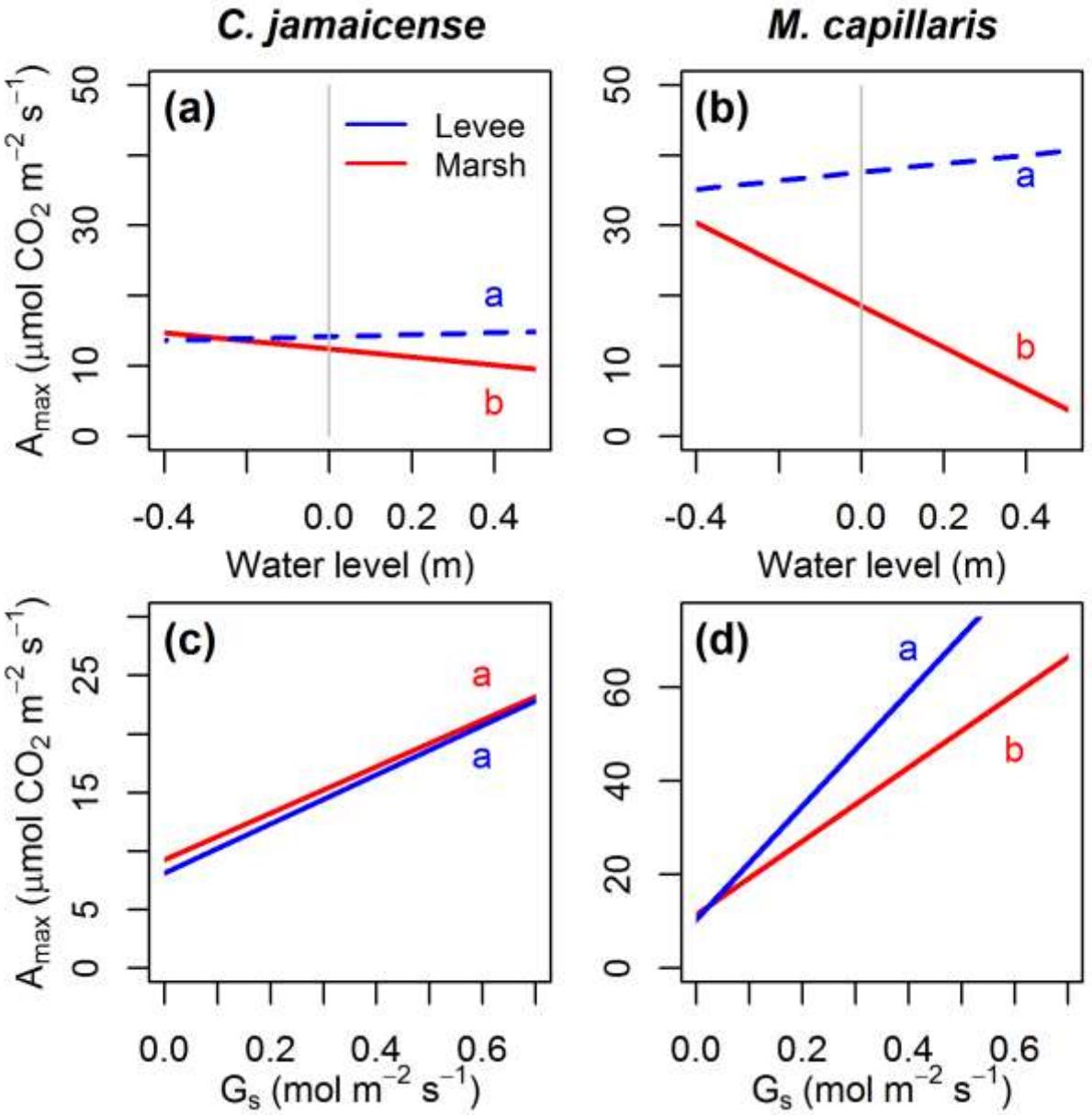
Amax: photosynthetic rate measured at PAR 2000 umol m^{-2} s^{-1}

Gs: stomatal conductance

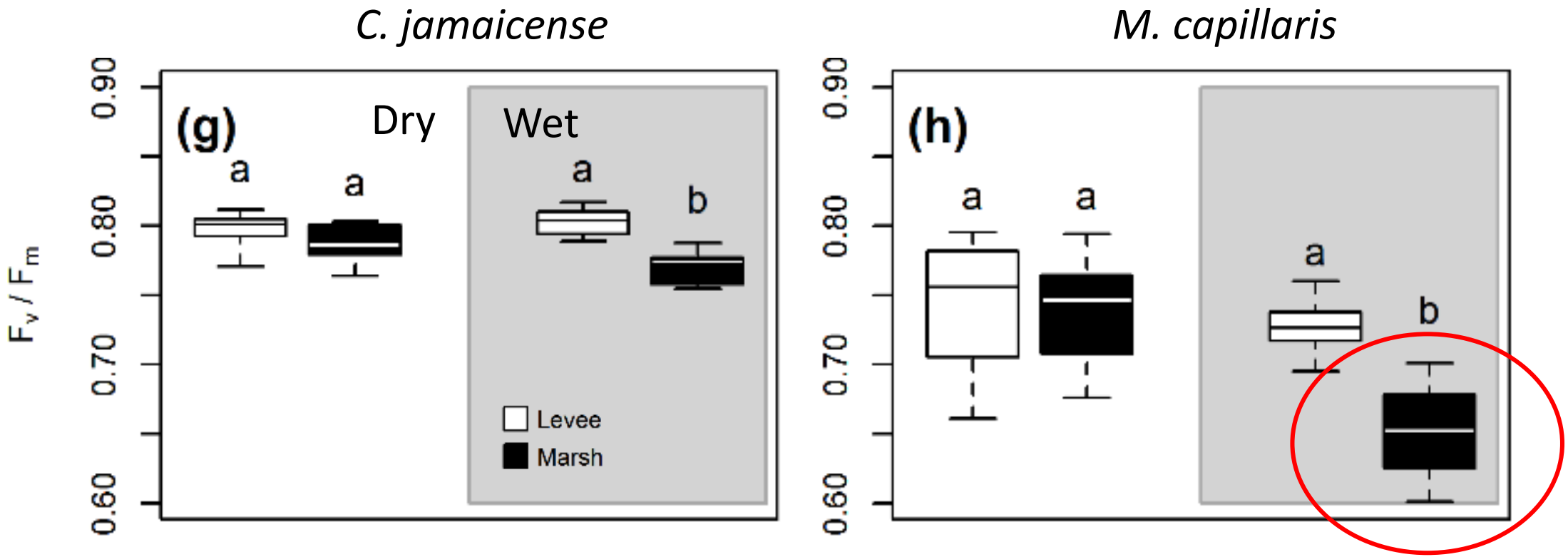


Mixed-effect models

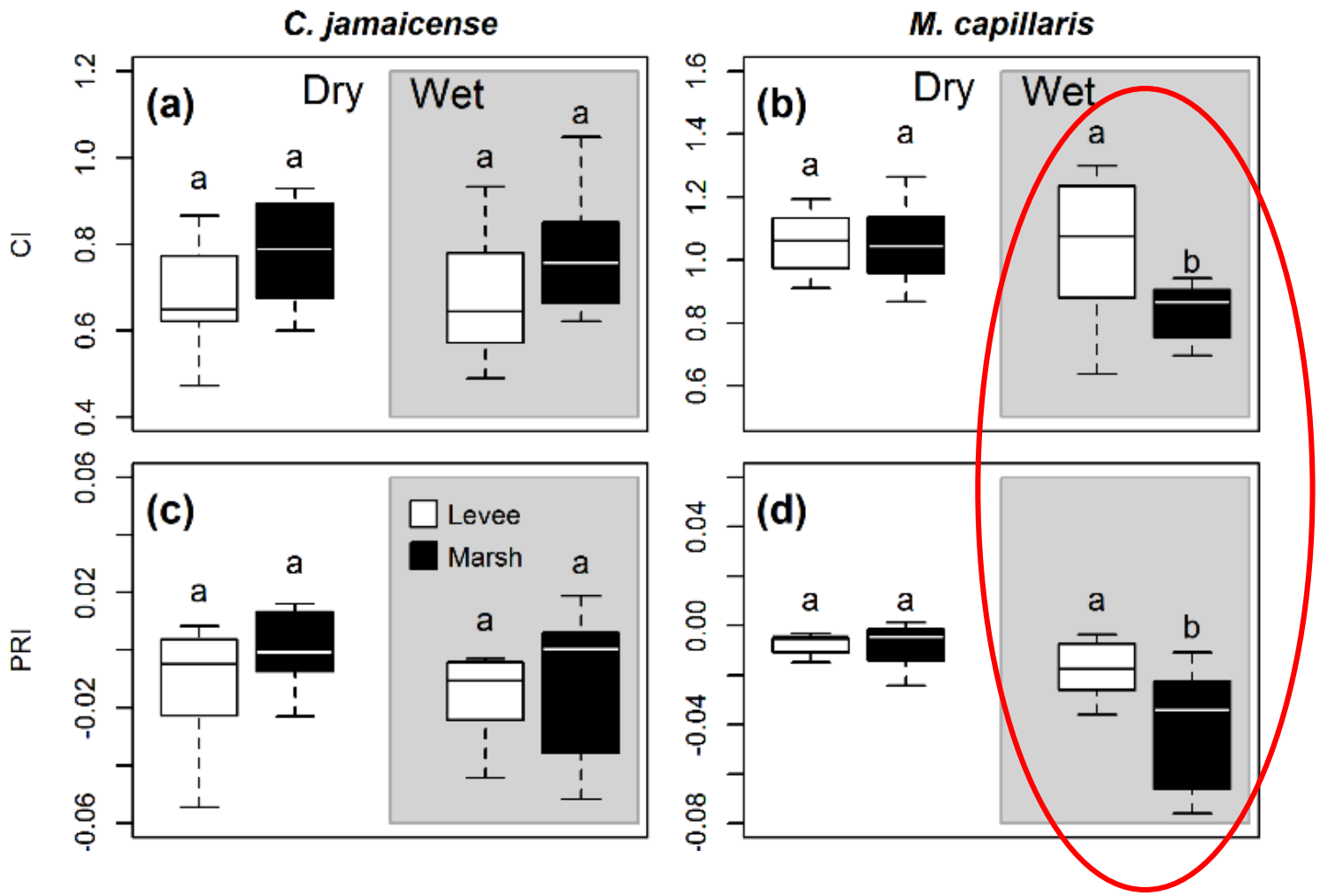
- Nonlinear relationship between water level and A_{max}
- Amax decline more dramatic in muhly grass
- Significant difference in A_{max} sensitivity to G_s in muhly grass

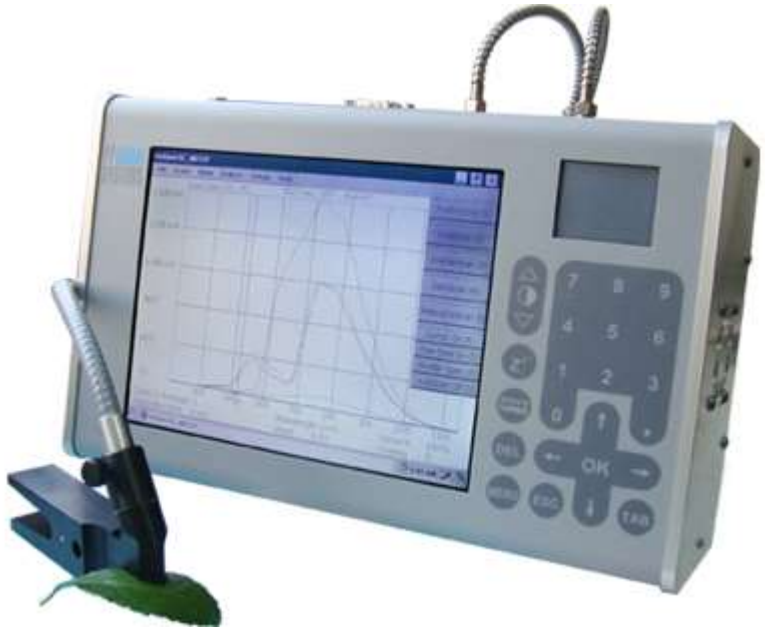


Chlorophyll fluorescence
(Fv/Fm: photosystem II maximum quantum efficiency)

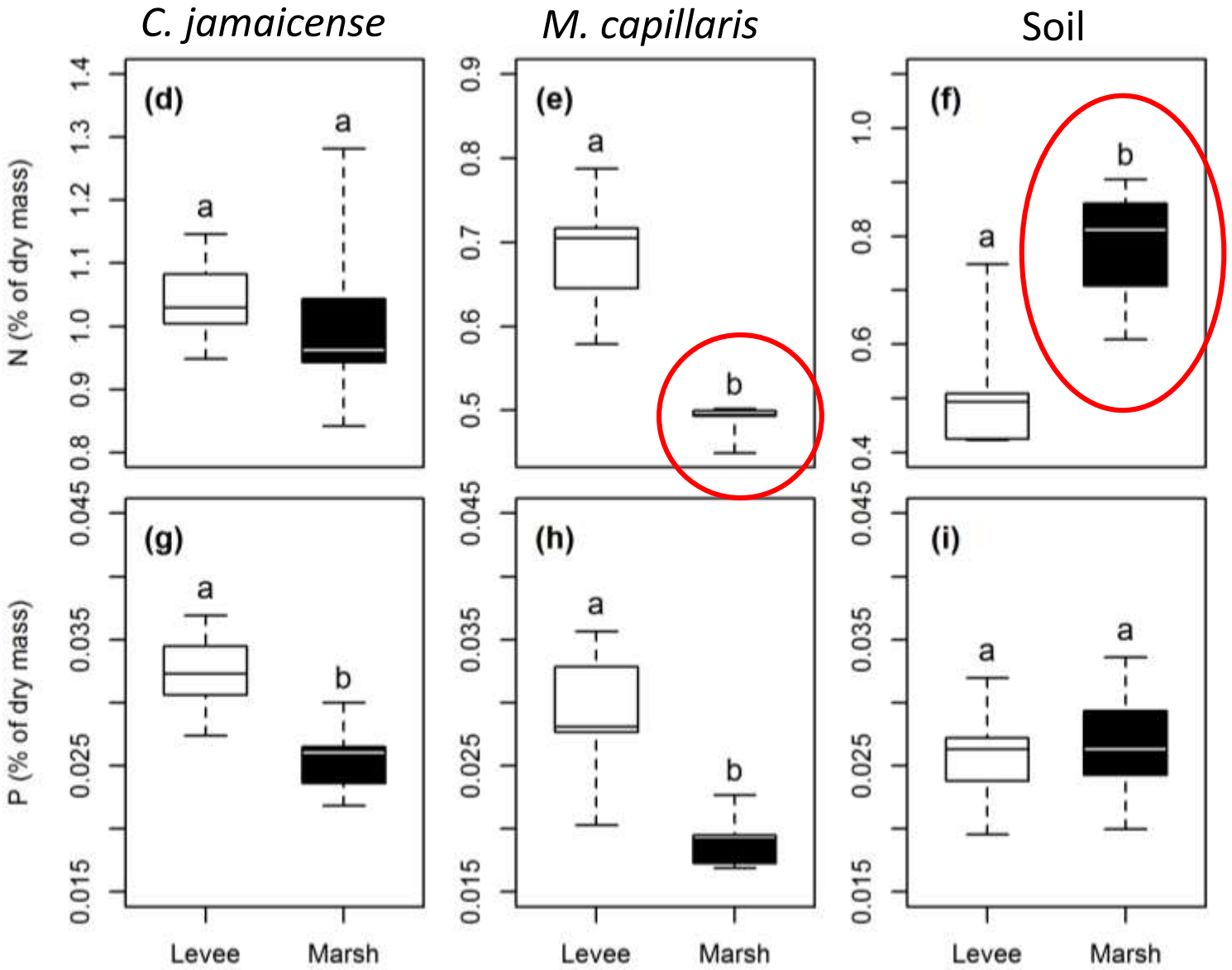


CI: chlorophyll index
PRI: photochemical reflectance index (xanthophyll activity)





Nutrients during wet season



Conclusion & implications

- Photosynthesis reduction of dominant plants (particularly muhly grass) in response to inundation is the cause of the lower GEP during wet season
- Photosystem impairment, in addition to stomatal control, is the primary cause of the A_{max} reduction in muhly grass when submerged.
- More studies in inundation needed (e.g. more species, models, etc.)
- Future change in water table seasonal pattern will affect carbon balance of the ecosystem.
- Species competition, C_3 vs C_4

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