Assessing the impact of climate warming on peatland water table dynamics

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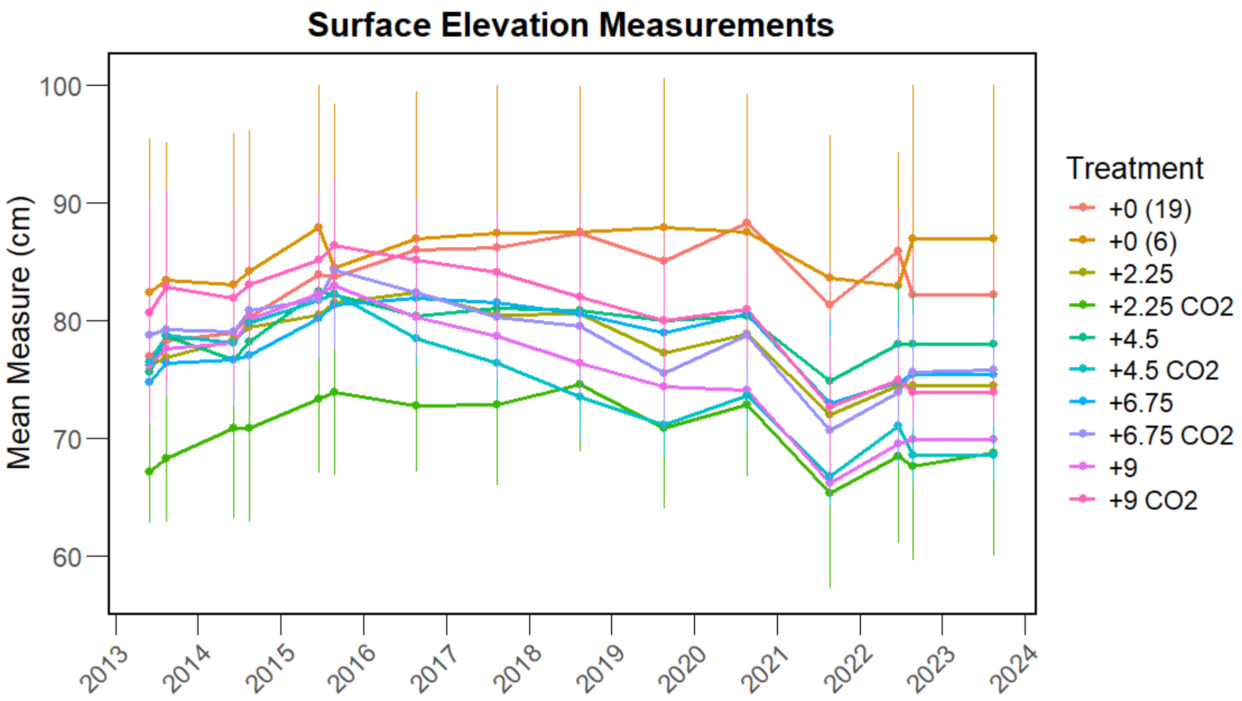
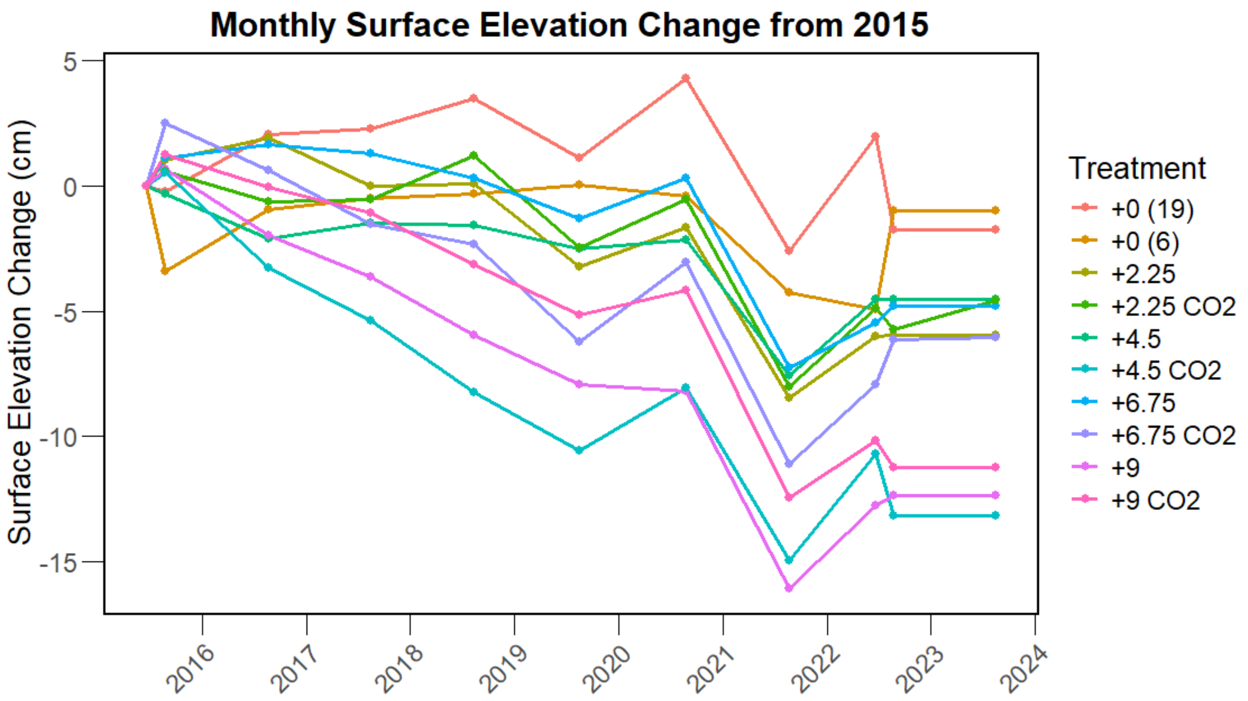
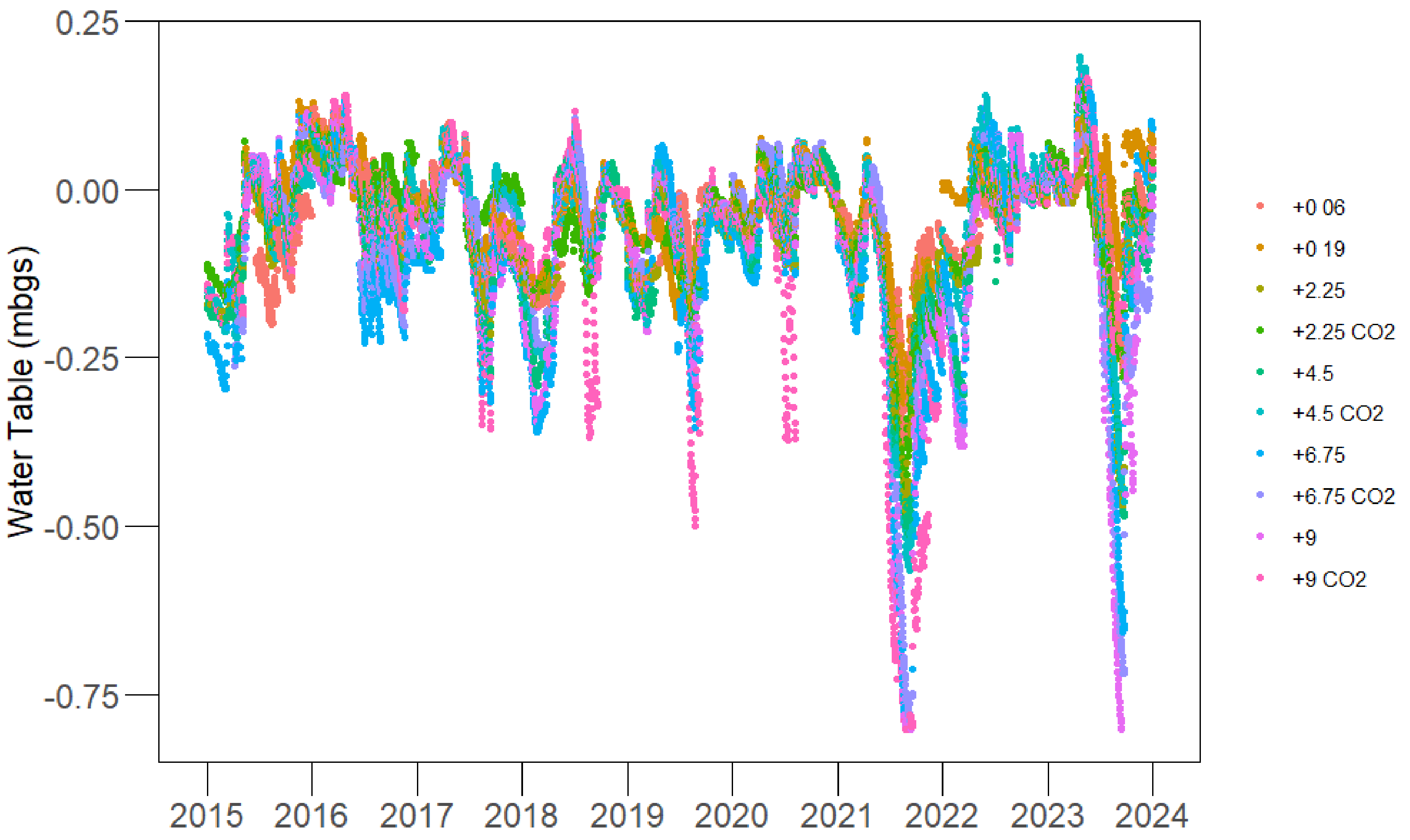
Decreasing ground surface elevation





Water table dynamics



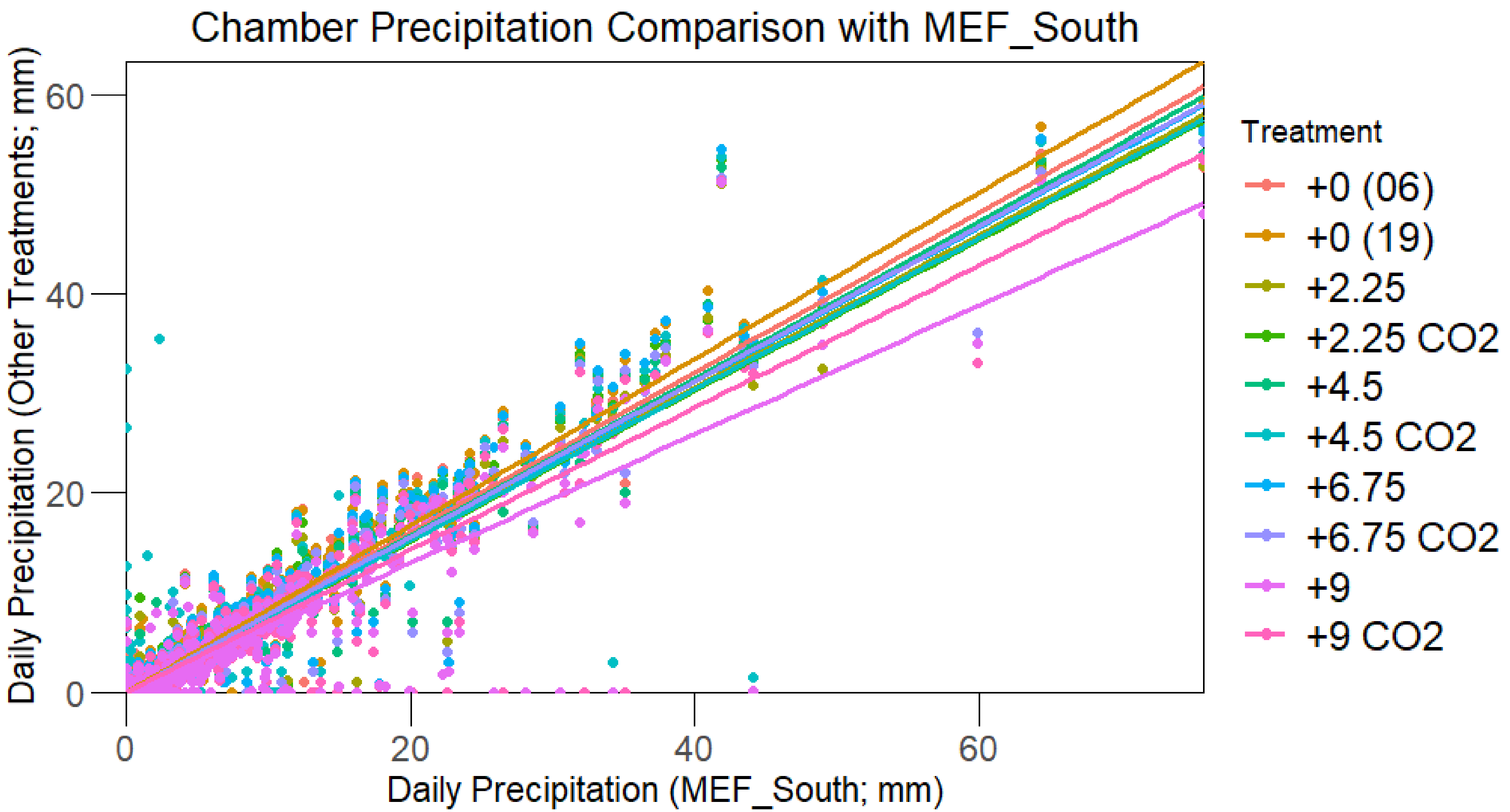
- Strongly linked to physical properties of peat

- How does water table feedback under warming climate?
  - Specific Yield (S_y)

$$S_Y = P/\Delta h$$

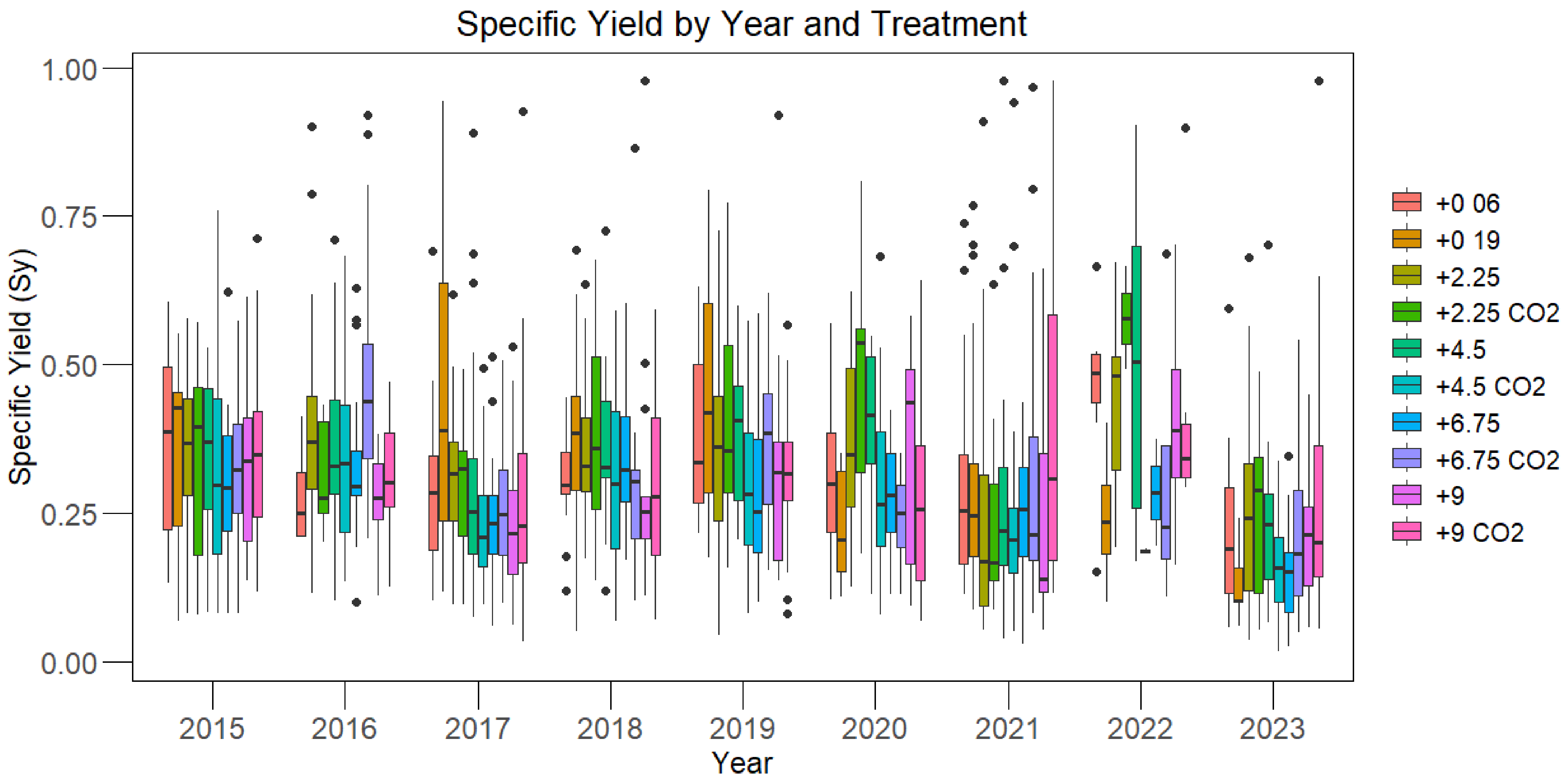
Bourgault et al., 2016

Individual Precipitation vs MEF_South (May – October)



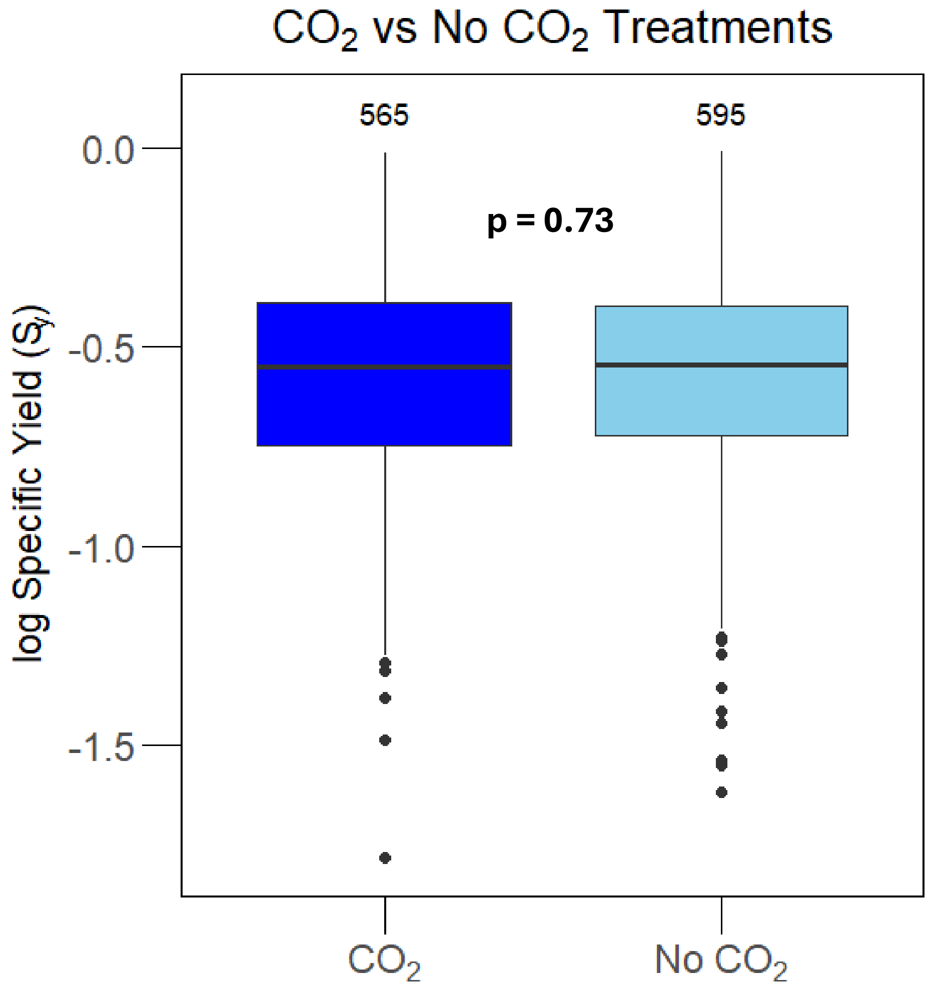
R^2	Slope (y ~ x)
0.925	0.802
0.928	0.835
0.927	0.764
0.872	0.756
0.926	0.788
0.812	0.759
0.876	0.777
0.931	0.779
0.827	0.647
0.873	0.713

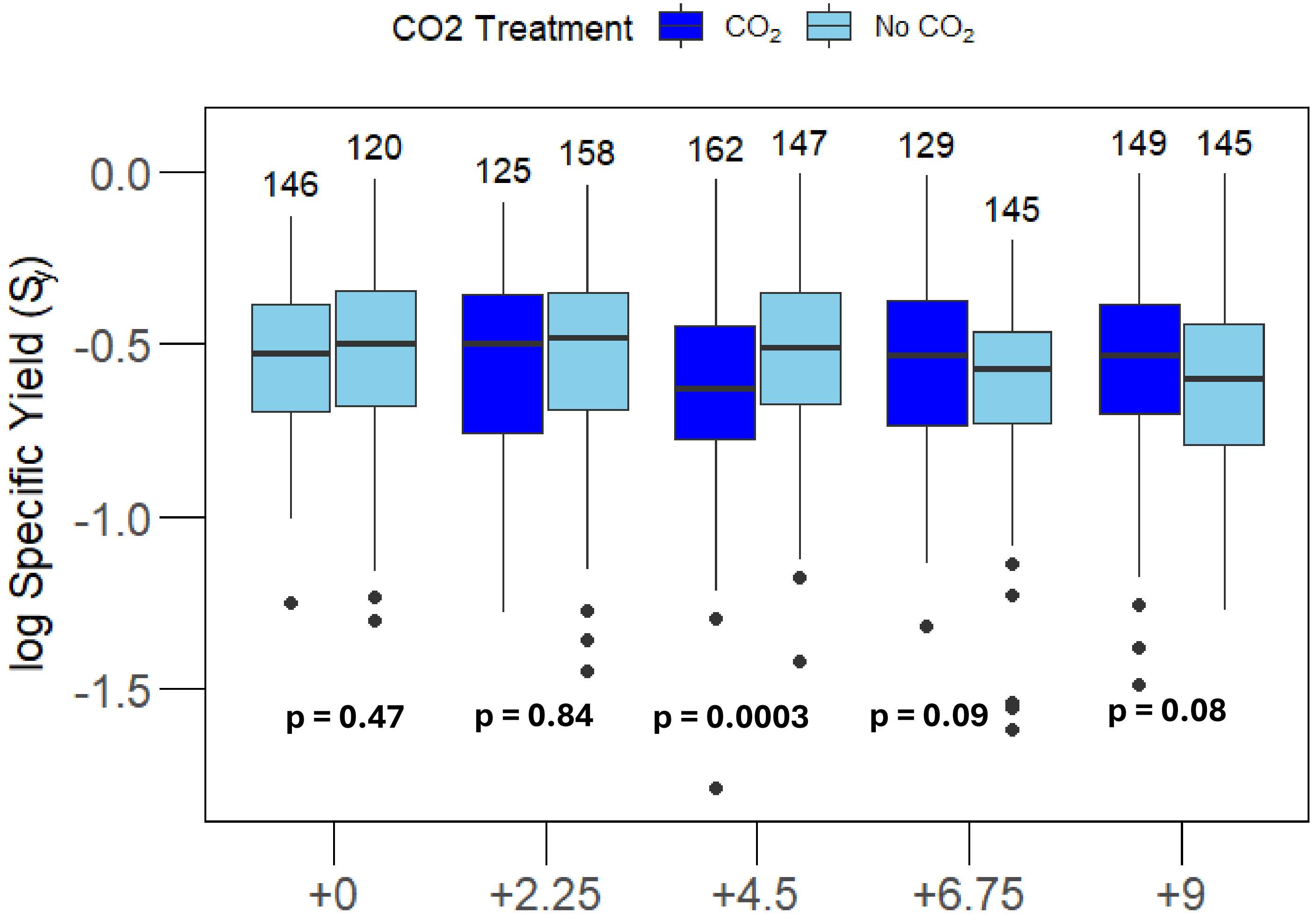
Annual S_y



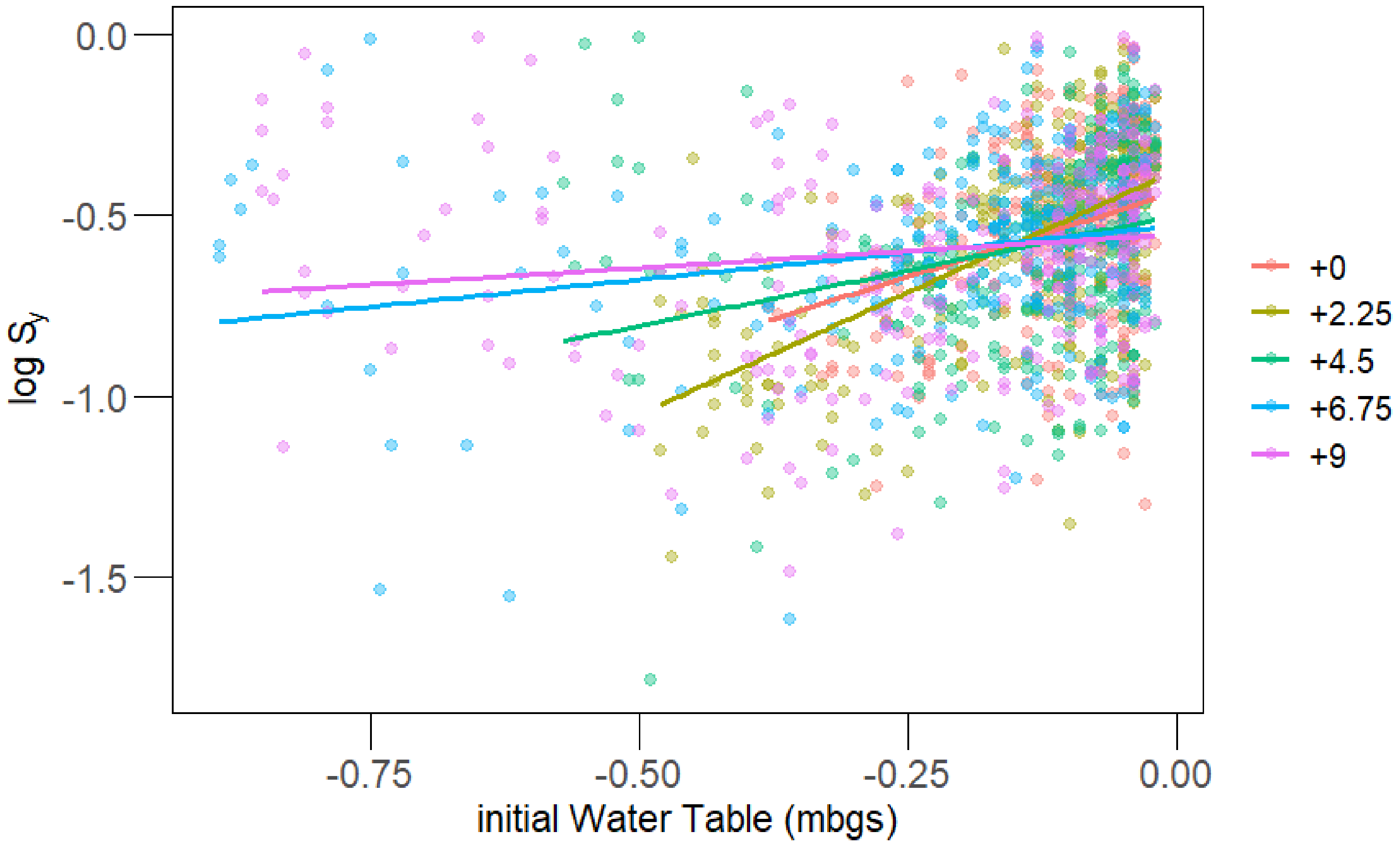
Specific Yield by Year and Treatment
Specific Yield (Sy)
1.00
0.75
0.50
0.25
0.00
2015
2016
2017
2018
2019
2020
2021
2022
2023
Year
+0 06
+0 19
+2.25
+2.25 CO2
+4.5
+4.5 CO2
+6.75
+6.75 CO2
+9
+9 CO2

S_y comparison between treatments





S_y comparison between treatments



- ANCOVA: significant

  +2.5: p = 0.07

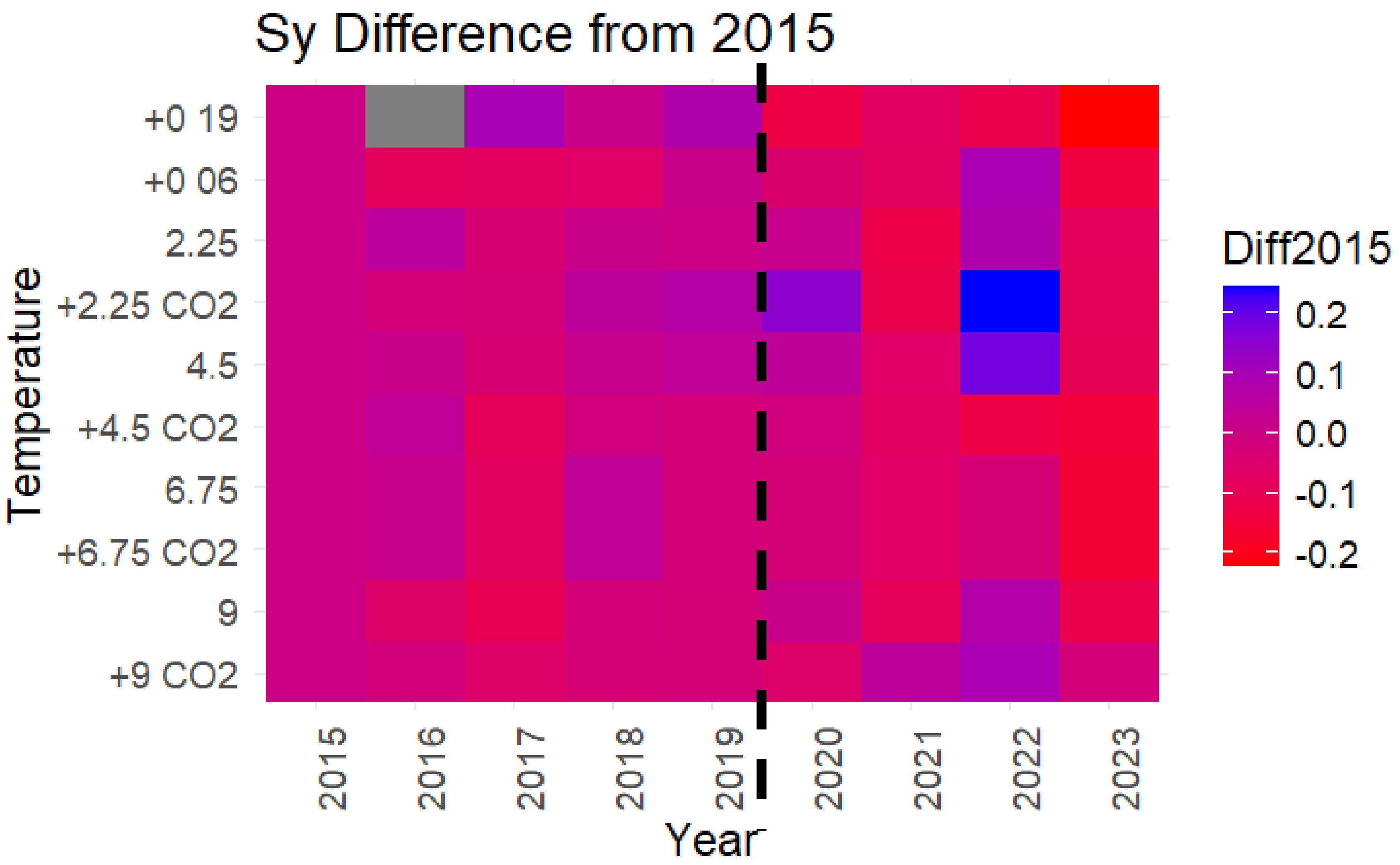
  +4.5: p = 0.07

  +6.75: p = 0.008

  +9: p = 0.0005

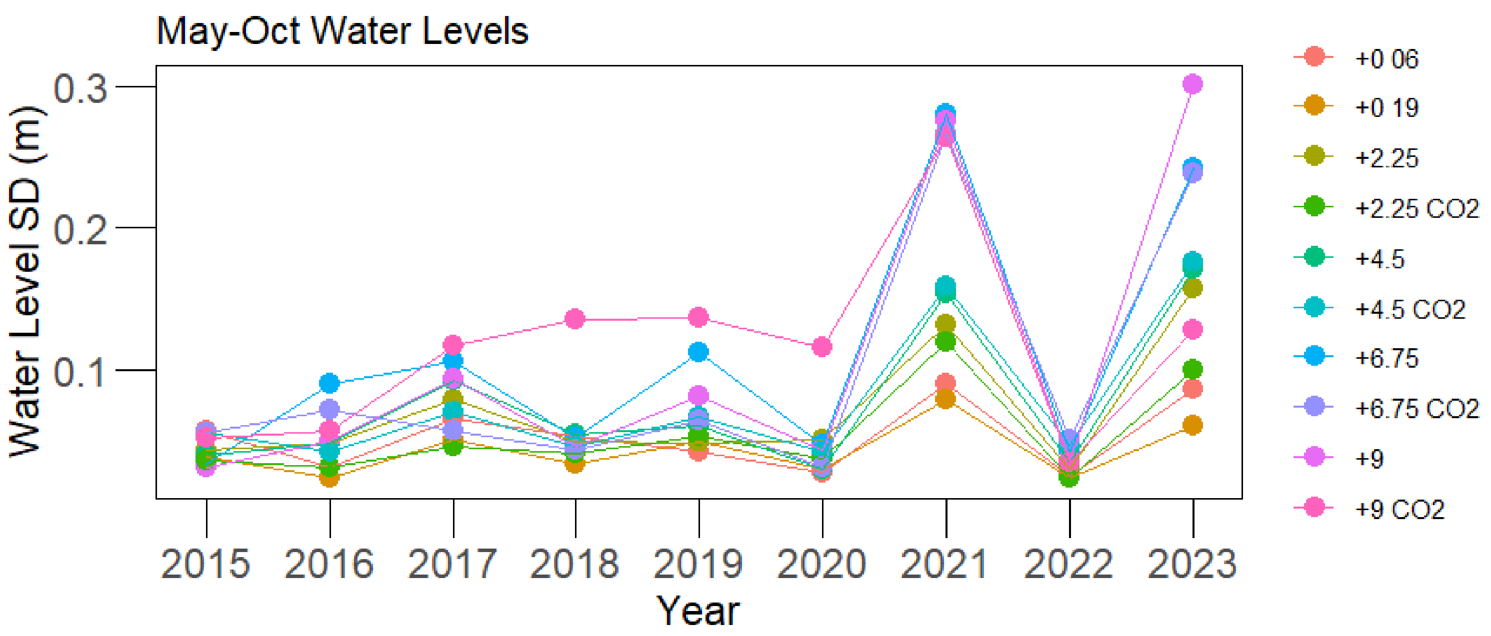
- Increasing variability of S_y with increasing temperatures

Annual S_y



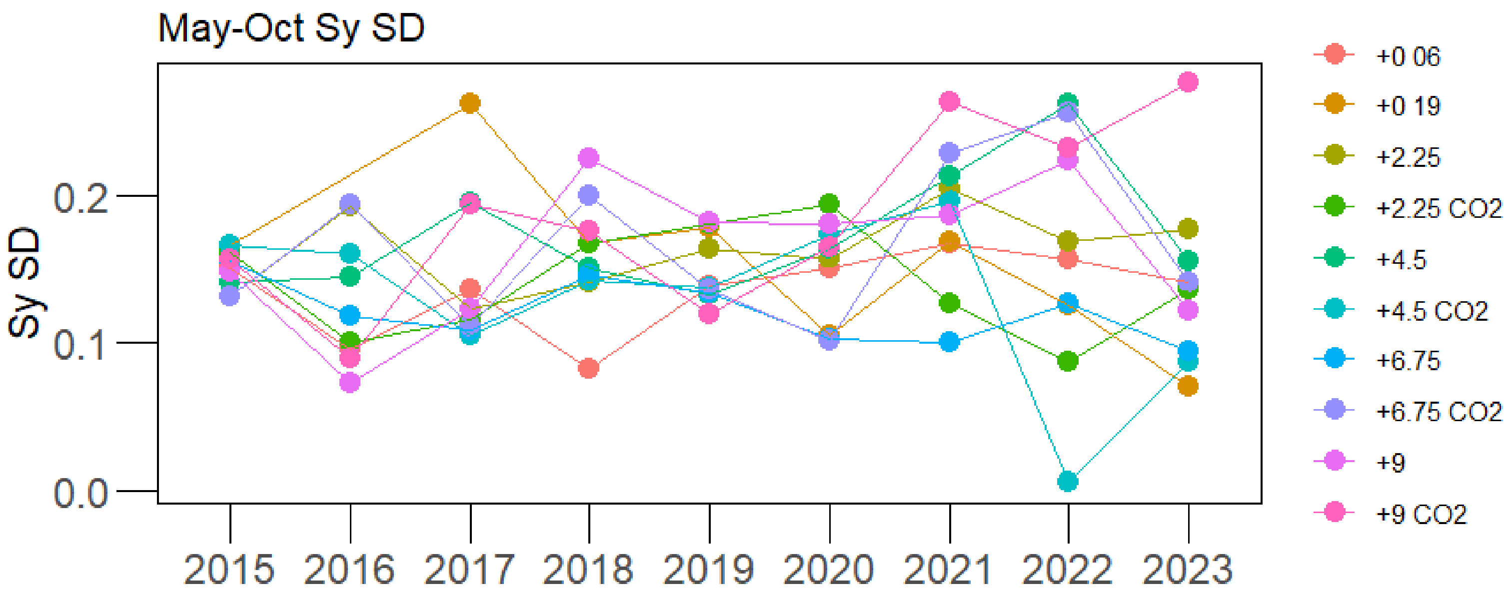
- Increasing S_y variability in later years

2021 & 2023 drought (?)



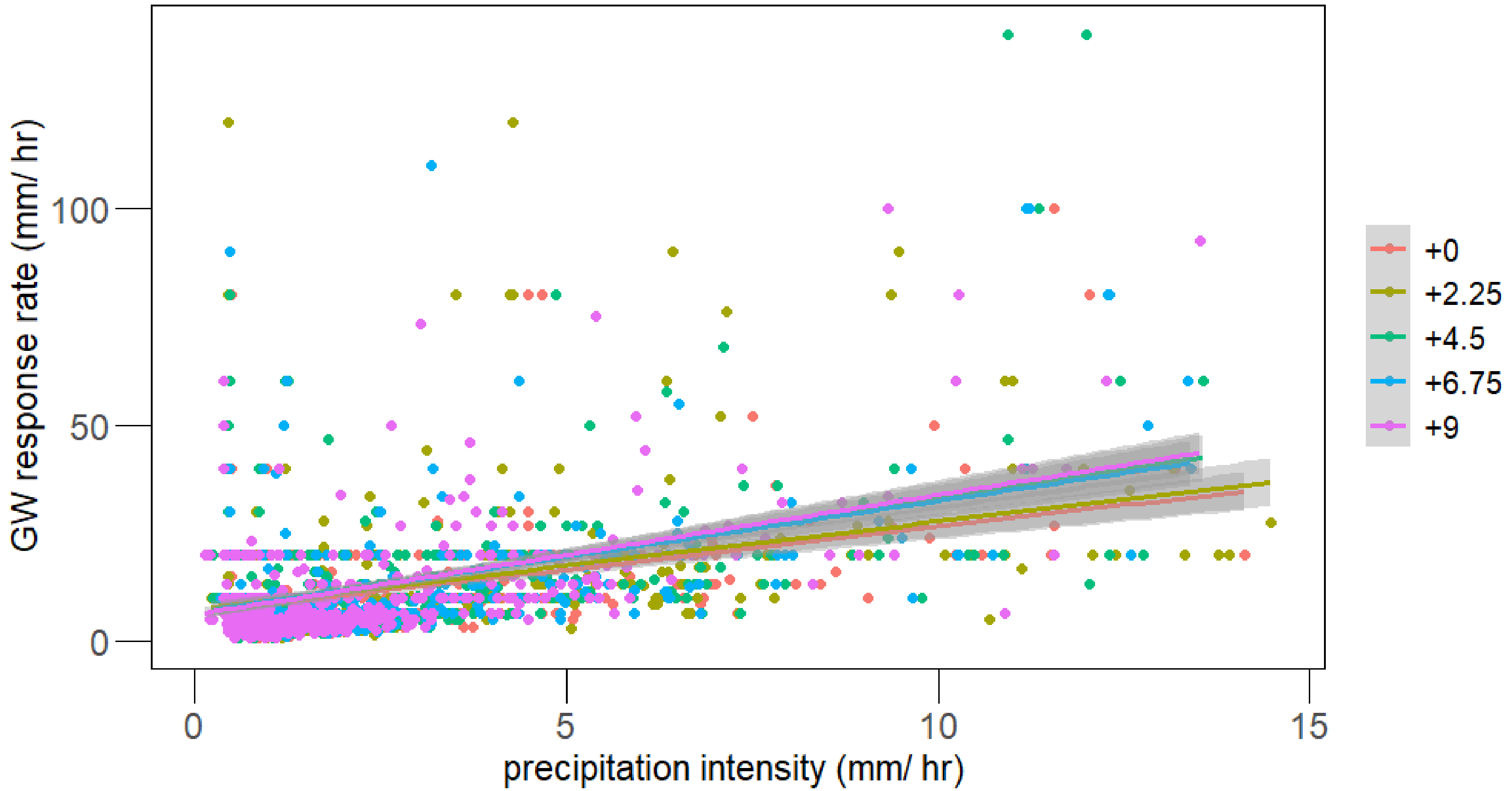
- Higher water level variability in warmer treatments

  Drought response



- Higher (?) S_y variability in warmer treatments

Groundwater response to precipitation

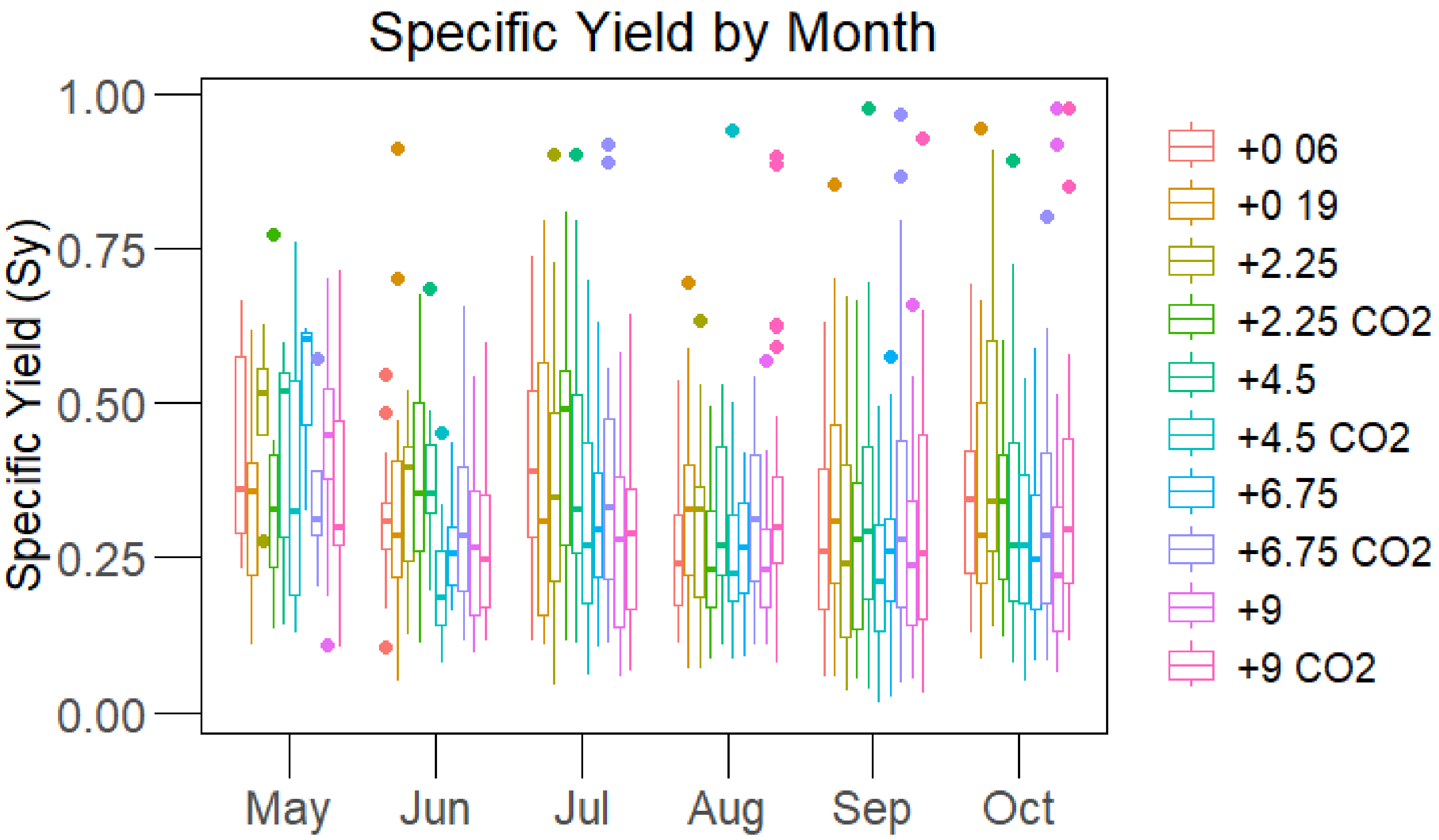


- ANCOVA: significant
  - PCPin:+4.5 p = 0.04
  - PCPin:+6.75: p = 0.07
  - PCPin+9: p = 0.02
- Faster groundwater response in higher temperatures
  - Flooding response

Preliminary Conclusions

- No S_y difference between CO_2 and no CO_2
- Warmer temperatures lead to general decline in S_y
- Increasing S_y variability in later years (drought response?)
- Decrease in S_y in warmer temperatures may lead to faster rise in groundwater (flooding)
- S_y changes in warmer temperatures are more likely due to hydrological feedback

Next Steps



- CO_2 vs no CO_2 temporal change?
- Seasonal analysis
- Specific extreme events such as droughts & flooding
- Peat properties, e.g., bulk density & porosity