**Paper updates:**

* Can’t use p-values with mixed effects

**HETARB – rerunning, models change slightly**

**Redo analysis**

**Go flam var by flam var – for each fully work through the analysis, then update paper or at least flag things in paper. Then start the next.**

**p-values should not be represented in the model figure unless they are adjusted.**

**Do we need to apply a Kenward-roger pvalue adjustment in python?**

**Make the same mixed effects model in R and python – are p-values the same?**

**FH**

Top models as singletons – testing single predictors:

0 thickness 364.006952 -0.035795 7.120582e-01 True

1 leaf\_sav 363.918737 -0.052448 6.383973e-01 True

2 mpa 363.735106 0.050483 5.231286e-01 True

3 start\_temp 362.308272 0.107725 1.736033e-01 True

4 dmc 362.239188 0.139224 1.646000e-01 True

Significant Interactions:

('lfm', 'sample\_wt')

('sample\_wt', 'mpa')

('sample\_wt', 'branching')

**Joe’s Model: 299.5**

fh ~ sample\_wt\*lfm + branching

**My Models *(not VIF tested)*: min 293.1**

fh ~ sample\_wt\*mpa + branching + start\_temp + stem\_sav

fh ~ sample\_wt\*mpa + branching + start\_temp + stem\_sav + thickness

fh ~ sample\_wt\*mpa + lfm + branching + start\_temp + stem\_sav

fh ~ sample\_wt\*mpa + branching + start\_temp + stem\_sav + leaf\_sav

fh ~ sample\_wt\*mpa + LMA + branching + start\_temp + stem\_sav

fh ~ sample\_wt\*mpa + leaf\_mass\_ratio + branching + start\_temp + stem\_sav

fh ~ sample\_wt\*mpa + lfm + branching + start\_temp + stem\_sav + thickness

fh ~ sample\_wt\*mpa + branching + start\_temp + dmc + stem\_sav

fh ~ sample\_wt\*mpa + branching + start\_temp + branch\_volume + stem\_sav

**Proposed Model change: 296.3**

***fh ~ sample\_wt\*mpa + branching + start\_temp + stem\_sav***

Model seems to really like start\_temp, stem\_sav, branching, some water variable, and ‘some other variable’ (dmc, LMR, LMA, thickness…).

**May swap between lfm or mpa – can justify which or why?**

* **In singular ols by species, lfm is sig and neg to ERIKAR; mpa is sig to none**

*Why is it throwing in some seemingly random other variable? Maybe ignore, it seems like ‘sample\_wt\*mpa + branching + start\_temp + stem\_sav’ is the core/base…*

FH increases with Mass

FH increases Drought stress

FH decreases with larger, droughteder (unexpected)

*FH increases with larger, higher lfm (unexpected)*

FH decreases with Stem SAV - larger flames with thinner stems

FH increases with start temp

FH increases with more branches per stem length

FH increases with larger, branchier samples

**Insights:**

The 1st order relationships generally make sense:

- ***Larger flames with thinner stems and larger samples*** make sense at this scale. Thinner stems for our samples likely meant more herbaceous stems that could be consumed by flaming ignition - thicker, woodier stems typically did not catch on fire but maybe smoldered later. ***At this sampling scale, larger and more herbaceous means more material combusting simultaneously = larger flames***.

- Why FH decreases with larger, droughteder (unexpected)? mpaXmass among species is relatively flat, fh vs mpaXmass -> tight cluster, relationship driven by outliers !!

- **Decision – do not use mpaXmass**

The interaction does not make sense and indicates possible beguiling effects from species.

Look at species boxplots for fh, lfm, mpa, mass, branching, sav

- plotting `mpaXmass` by species - there is NOT a clear pattern except for HETARB which is low.

- there is a much clearer species pattern for `lfmXmass`

- the regplot for `mpaXmass` looks dubious, `lfmXmass` also clearer here

- THE SIGN FOR `lfmXmass` is wrong, but likely driven by interspecific patterns look at CEAGRI, MALLAU, ERIKAR - nice clear story!!

**Examining the relationship fh~LFM for each species:**

*Simple OLS Model, no mixed effects, examining pvalue for lfm and coef.*

- Negative and sig (expected) – ERIKAR -> ***ERIKAR also had the largest 25% to 75% range of all species***

- Negative NOT sig (expected) – ARCDEN, SALLEU

- Positive NOT sig (unexpected) – ARTCAL, CEAGRI, MALLAU, SALAPI

- Positive and sig (unexpected) –

**Important Notes**

=> WETTEST and DRIEST samples were generally LIGHTER (regplot order 2)

=> HEAVIEST were DRIER

=> Standalone LFM overall - wetter has higher FH - nonsense?

=> Looking at FH vs LFM by species - most have + (nonsense) coef but some have - (expected) coef

=> So this goes back to species - the species that were typically drier and lighter typically had the lower FH; while the heavier wetter ones had the higher FH

**Conclusion?** - Mass matters more, maybe mass drives the pattern for FH overall, but mass and LFM seem to be been correlated through species

**FD:**

FD increases with Mass and LMR

The signal here seems pretty clear - larger samples with more leaves = longer flame time. This makes sense at this scale. The leaves are more accessible to flame for most of our species (most often stems did not carry flame nearly as well as the leaves did).

Closed.

**TX:**

Branching came out very strong - more branching, more temp change.

Mass also strong - larger = more temp change.

Starting temp was negative, which actually makes sense. The temp will increase to a max temperature (it is not like heat flux) - so a higher start temp raises the floor and decreases the difference...

Stem SAV - thinner stems = more temp change, might make sense. Thinner stems likely means (1) less fluffy sample? (2) flame is more likely to get into the stems, goes with the relationship found that higher thinner stems = higher FH -> more likely to intersect a thermocouple.

Overall - suspicious that sample geometry was affecting the integrity of the measurement - fluffier samples = flame more likely to intersect a thermocouple.

TX and FH are NOT correlated. FH was measured from the bottom to top of flame. Fluffier samples lift the bottom of the flame (and also the top of the flame) meaning that fluffy samples with smaller flame heights will still be closer to the thermocouples.

Next step:

Check distribution by species: Stem SAV, Mass, Branching, Branch Volume

Were thinner (smaller leaf SAV) samples fluffier? YES thinner samples had higher branching, but they were NOT significantly correlated

**HX:**

HFX increases with LMA, LMR, Mass

This aligns with expectations. Heavier samples, with more leaves, and more robust leaves release more heat. None of the leaves in our test species are very thick, so higher LMA = less flashy.

Closed.