Code

Krill Respirometry Statistics - Summer 2019 Krill

Hello World

Author: OA Lab, NWFSC Title: Krill Respirometry Statistics - Summer 2019 Krill Date: February 2021 (R notebook document)

Version Check

Libraries

1.) Setting Working Directory

Code

2.) DF Creation

Code

3.) Summary Statisitics on the Unfiltered Dataframe dSlopes

Code

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

Code

Treatment <chr>	sd <dbl>	mean <dbl>	median <dbl>	IQR <dbl>	n <int>	se <dbl>	ci <dbl>
CHG	0.005583358	-0.001776208	-0.002036407	0.004907458	16	0.001395839	0.002735845
CUR	0.011298257	0.002379594	0.001020978	0.005144002	19	0.002591998	0.005080316
TMP	0.004838440	-0.002500531	-0.003650568	0.005695567	16	0.001209610	0.002370835

3 rows

Code

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

Code

Treatment <chr>	sd <dbl>	mean <dbl>	median <dbl>	IQR <dbl>	n <int>	se <dbl>

Treatment <chr>	sd <dbl>	mean <dbl>	median <dbl>	IQR <dbl>	n <int>	se <dbl>
CHG	0.004065527	0.0005785529	0.0014299211	0.002052282	16	0.0010163817
CUR	0.003283892	-0.0010072002	-0.0006882532	0.003677814	19	0.0007533765
TMP	0.003494196	0.0010753163	0.0006012823	0.005156133	16	0.0008735490

3 rows | 1-7 of 8 columns

Code

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

Code

Treatment <chr>	sd <dbl>	mean <dbl>	median <dbl>	IQR <dbl>	n <int>	se <dbl>
CHG	0.003173232	-0.0004976462	-4.158713e-05	0.002900971	16	0.0007933080
CUR	0.002298790	-0.0003071082	-2.570656e-05	0.002418887	19	0.0005273785
TMP	0.002813950	0.0002339053	4.077097e-04	0.003848429	16	0.0007034875

3 rows | 1-7 of 8 columns

Code

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

Code

Treatment <chr>	sd <dbl>	mean <dbl>	median <dbl>	IQR <dbl>	n <int>	se <dbl>	ci <dbl>
CHG	0.004265618	-0.008106896	-0.007795664	0.007238001	16	0.001066405	0.002090153
CUR	0.006674893	-0.010331173	-0.009898894	0.009208639	19	0.001531325	0.003001398
TMP	0.006783077	-0.009752567	-0.008601520	0.009479005	16	0.001695769	0.003323708

3 rows

Code

3.a Slope Tables 1hr

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.0056	-0.0018	-0.0020	0.0049	16	0.0014	0.0027
CUR	0.0113	0.0024	0.0010	0.0051	19	0.0026	0.0051
TMP	0.0048	-0.0025	-0.0037	0.0057	16	0.0012	0.0024

3.b Slope Tables 80%

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.0041	0.0006	0.0014	0.0021	16	1e-03	0.0020
CUR	0.0033	-0.0010	-0.0007	0.0037	19	8e-04	0.0015
TMP	0.0035	0.0011	0.0006	0.0052	16	9e-04	0.0017

3.c Slope Tables 70%

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.0032	-5e-04	0e+00	0.0029	16	8e-04	0.0016
CUR	0.0023	-3e-04	0e+00	0.0024	19	5e-04	0.0010
TMP	0.0028	2e-04	4e-04	0.0038	16	7e-04	0.0014

3.d Slope Tables all points

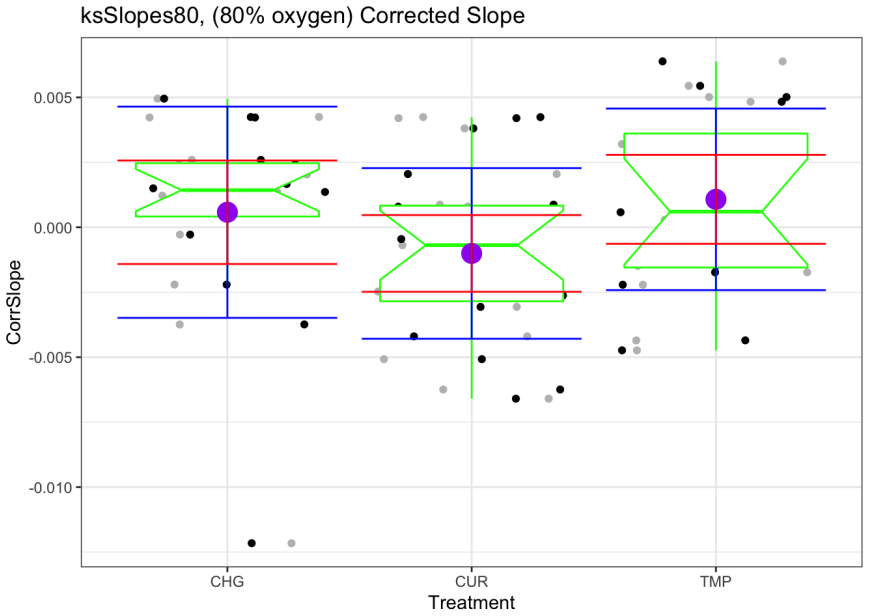
Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.0043	-0.0081	-0.0078	0.0072	16	0.0011	0.0021
CUR	0.0067	-0.0103	-0.0099	0.0092	19	0.0015	0.0030
TMP	0.0068	-0.0098	-0.0086	0.0095	16	0.0017	0.0033

4.) Summary Plots

4.a 80% Threshold Corrected Slopes

Code

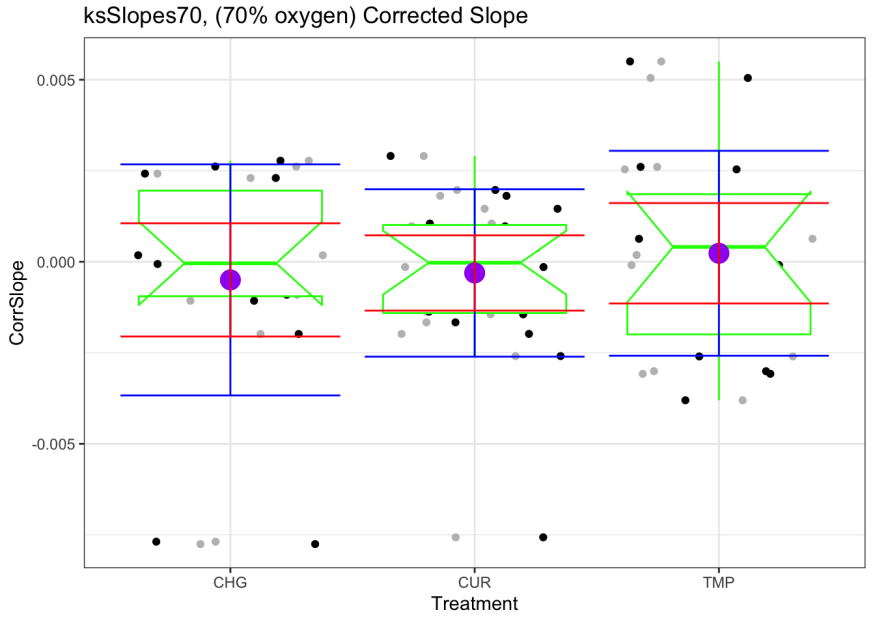


The purple dots represent the mean- all trials included Confidence Intervals set to 95 Green boxplots show from the 25th percentil to the 75th percentile error bars +/- SD shown in blue error bars(CI) +/- our confidence intervals- shown in red

4.b Plots 70% Slope for Corrected Slopes

Code

```
## notch went outside hinges. Try setting notch=FALSE.
## notch went outside hinges. Try setting notch=FALSE.
```

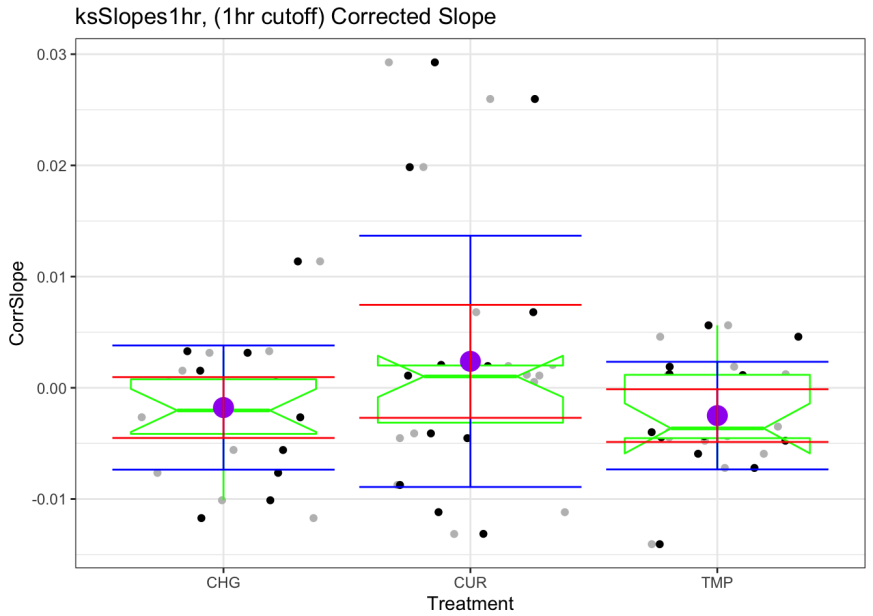


The purple dots represent the mean- all trials included Confidence Intervals set to 95 Green boxplots show from the 25th percentil to the 75th percentile error bars +/- SD shown in blue error bars(CI) +/- our confidence intervals- shown in red

4.c Plots threshold (1hr) Slope for Corrected Slopes

Code

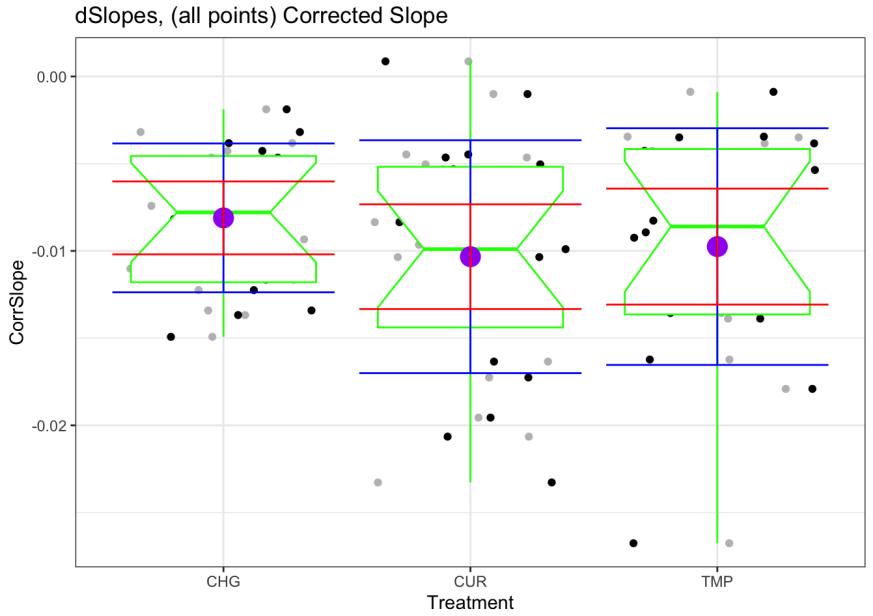
```
## notch went outside hinges. Try setting notch=FALSE.
## notch went outside hinges. Try setting notch=FALSE.
```



The purple dots represent the mean- all trials included Confidence Intervals set to 95 Green boxplots show from the 25th percentil to the 75th percentile error bars +/- SD shown in blue error bars(CI) +/- our confidence intervals- shown in red

4.c Plots 1hr threshold Slope for Corrected Slopes

Code



5.) Descriptive Statisitics

Code

	Avg All Points Corrected Slopes	Med All Points Corrected Slopes	All Points Corrected Slopes SD	Avg 80% DO Corrected Slopes	Med 80% DO Corrected Slopes	80% DO Corrected Slopes SD	Avg 70% DO Corrected Slopes	Med 70% DO Corrected Slopes	70% DO Corrected Slopes SD	Avg 1hr Corrected Slopes	Med 1hr Corrected Slopes	1hr Corrected Slopes SD
CHG	-0.0081069	-0.0077957	0.0042656	0.0005786	0.0014299	0.0040655	-0.0004976	-0.0000416	0.0031732	-0.0017762	-0.0020364	0.0055834
CUR	-0.0103312	-0.0098989	0.0066749	-0.0010072	-0.0006883	0.0032839	-0.0003071	-0.0000257	0.0022988	0.0023796	0.0010210	0.0112983
TMP	-0.0097526	-0.0086015	0.0067831	0.0010753	0.0006013	0.0034942	0.0002339	0.0004077	0.0028139	-0.0025005	-0.0036506	0.0048384

6.) Fitting my Linear Mixed-Effects Models to my Dataframes

Code

```
## [1] 51
```

Code

6.a 1hr Dataframe - LMER

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.1hr
##
## REML criterion at convergence: -329.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.68638 -0.47569  0.00437  0.51632  2.75955
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.441e-05 0.005866
##  Residual             4.178e-05 0.006464
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)  -0.001302   0.003369  8.777260  -0.386    0.708
## TreatmentCUR  0.004016   0.004212 14.743842   0.953    0.356
## TreatmentTMP -0.001199   0.005583  6.333602  -0.215    0.837
##
## Correlation of Fixed Effects:
##             (Intr) TrtCUR
## TreatmntCUR -0.670
## TreatmntTMP -0.604  0.405
```

Code

"1hr Dataset" - No Treatment Effect Found

Random Effects Model variance accounting for a possible MOATs effect remains significantly small. No treatment effect observed. Neither correlation or T values between "All Change(CHG)" to "Current(CUR)" and "High Temperature(TMP)" This model doesn't consider High Temperature directly against Current Model re-ogranized/re-leveled below

6.b 1hr Dataframe - LMER releved Current 1st

Code

```
## NULL
```

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.1hr
##
## REML criterion at convergence: -329.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.68638 -0.47569  0.00437  0.51632  2.75955
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.441e-05 0.005866
##  Residual             4.178e-05 0.006464
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)   0.002713   0.003173  8.789085   0.855    0.415
## TreatmentCHG -0.004016   0.004212 14.743842  -0.953    0.356
## TreatmentTMP -0.005214   0.005467  6.253781  -0.954    0.376
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.616
## TreatmntTMP -0.580  0.357
```

The Current Conditions to Hight Temperature comparison did not display a treatment effect.

Possible reasons for such small amount of variance include only 51 animals in trial. 16 animals from the "All Change" treatment were in included across four trials. 19 animals from the "Current" treatment were in included across four trials. 16 animals from the "High Temperarure" treatment were in included across four trials. (totals 51 animals)

so signal over the noise- why?

1hr may not have allowed enough observations to show a disernable difference across treatments. However, Krill could just be proving to be a robust organism, able to withstand a cross stress environment. It's more likely that sample size was small.

6.c 80% Threshold Dataframe - LMER

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.80
##
## REML criterion at convergence: -395.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.4943 -0.5586  0.1519  0.5739  1.4604
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 2.347e-07 0.0004845
##  Residual             1.287e-05 0.0035869
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   0.0005746  0.0009346  7.6538185   0.615    0.557
## TreatmentCUR -0.0016000  0.0012697  7.5087302  -1.260    0.245
## TreatmentTMP  0.0005007  0.0013398  4.4345997   0.374    0.726
##
## Correlation of Fixed Effects:
##             (Intr) TrtCUR
## TreatmntCUR -0.733
## TreatmntTMP -0.698  0.511
```

Code

The 80% (DO) Threshold t values are slightly smaller. The variance around a MOATs effect remains significantly small. No treatment effect observed. Model re-organized/re-leveled below to compare "Current" against "High Temperature" directly

6.d 80% Threshold - LMER releved Current 1st

Code

```
## NULL
```

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.80
##
## REML criterion at convergence: -395.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.4943 -0.5586  0.1519  0.5739  1.4604
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 2.347e-07 0.0004845
##  Residual             1.287e-05 0.0035869
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.0010254  0.0008642  5.6876601  -1.187    0.283
## TreatmentCHG  0.0016000  0.0012697  7.5087302   1.260    0.245
## TreatmentTMP  0.0021007  0.0012916  3.8400049   1.626    0.182
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.677
## TreatmntTMP -0.669  0.453
```

When comparing Current against "High Temperature" and "All Change" the T values remain small but the TMP to CUR is somewhat larger.

Still, no discernible treatment effect, no discernible MOATS effect.

6.e 70% Threshold Dataframe - LMER

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.70
##
## REML criterion at convergence: -431.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1536 -0.5207  0.1268  0.5546  1.5776
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.331e-06 0.001825
##  Residual             5.069e-06 0.002251
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -3.876e-04  1.089e-03  9.300e+00  -0.356    0.730
## TreatmentCUR  1.416e-05  1.384e-03  1.437e+01   0.010    0.992
## TreatmentTMP  6.215e-04  1.780e-03  6.780e+00   0.349    0.738
##
## Correlation of Fixed Effects:
##             (Intr) TrtCUR
## TreatmntCUR -0.680
## TreatmntTMP -0.612  0.416
```

Code

The variance around a MOATs effect remains significantly small in this 70% Threshold dataset. No treatment effect observed. Model re-organized/re-leveled below to compare "Current" against "High Temperature" directly

6.f 70% Threshold - LMER releved Current 1st

Code

```
## NULL
```

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.70
##
## REML criterion at convergence: -431.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1536 -0.5207  0.1268  0.5546  1.5776
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.331e-06 0.001825
##  Residual             5.069e-06 0.002251
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -3.734e-04  1.025e-03  9.401e+00  -0.364    0.724
## TreatmentCHG -1.416e-05  1.384e-03  1.437e+01  -0.010    0.992
## TreatmentTMP  6.073e-04  1.742e-03  6.715e+00   0.349    0.738
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.628
## TreatmntTMP -0.589  0.370
```

No discernible treatment effect, no discernible MOATS effect. None of the "threshold confined" datasets displayed a MOATs or Treatment Effect.

Below shows the comparison is slopes values when all data points were considered.

6.g All Points "dSlopes" Dataframe - LMER

Code

```
## boundary (singular) fit: see ?isSingular
```

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: dSlopes
##
## REML criterion at convergence: -345.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8039 -0.6542  0.1125  0.7677  1.8463
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 0.000e+00 0.000000
##  Residual             3.677e-05 0.006064
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)  -0.008107   0.001516 48.000000  -5.348 2.44e-06 ***
## TreatmentCUR -0.002224   0.002058 48.000000  -1.081    0.285
## TreatmentTMP -0.001646   0.002144 48.000000  -0.768    0.446
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TrtCUR
## TreatmntCUR -0.737
## TreatmntTMP -0.707  0.521
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

Code

The variance around a MOATs effect remains so significantly small. No MOATs effect No treatment effect observed. Model re-organized/re-leveled below to compare "Current" against "High Temperature" directly

6.f) All Points - LMER releved Current 1st

Code

```
## NULL
```

Code

```
## boundary (singular) fit: see ?isSingular
```

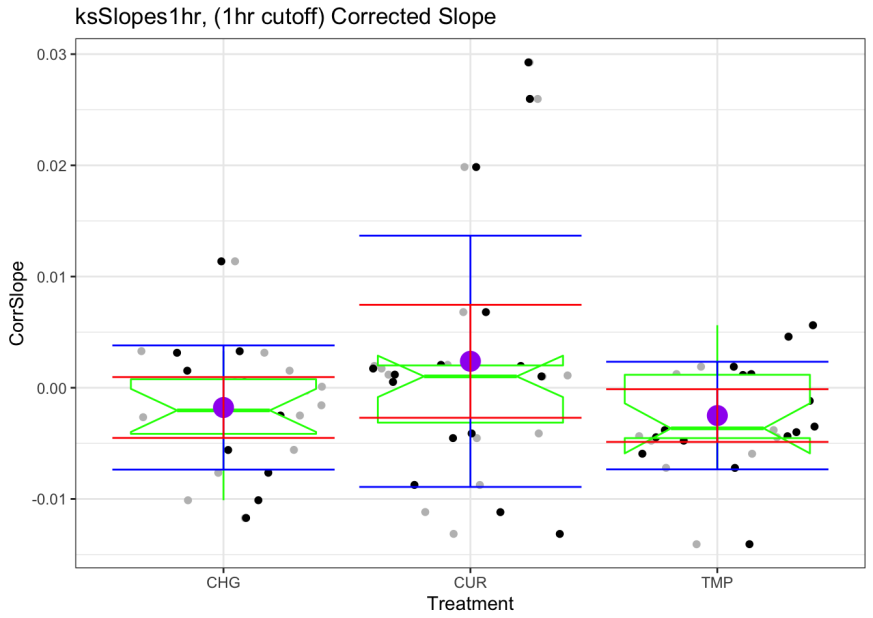
Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: dSlopes
##
## REML criterion at convergence: -345.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8039 -0.6542  0.1125  0.7677  1.8463
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 0.000e+00 0.000000
##  Residual             3.677e-05 0.006064
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.0103312  0.0013912 48.0000000  -7.426 1.64e-09 ***
## TreatmentCHG  0.0022243  0.0020576 48.0000000   1.081    0.285
## TreatmentTMP  0.0005786  0.0020576 48.0000000   0.281    0.780
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.676
## TreatmntTMP -0.676  0.457
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

Code

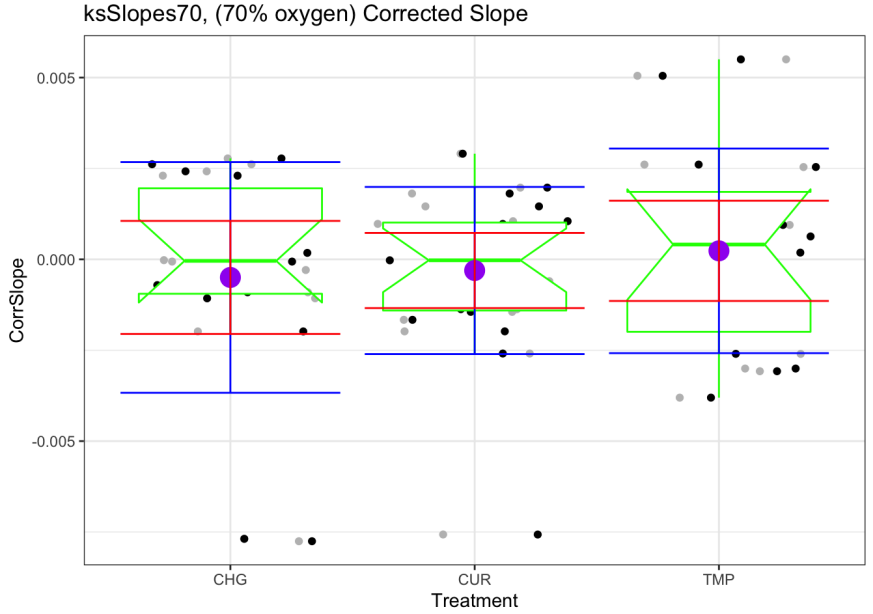
Code

```
## notch went outside hinges. Try setting notch=FALSE.
## notch went outside hinges. Try setting notch=FALSE.
```

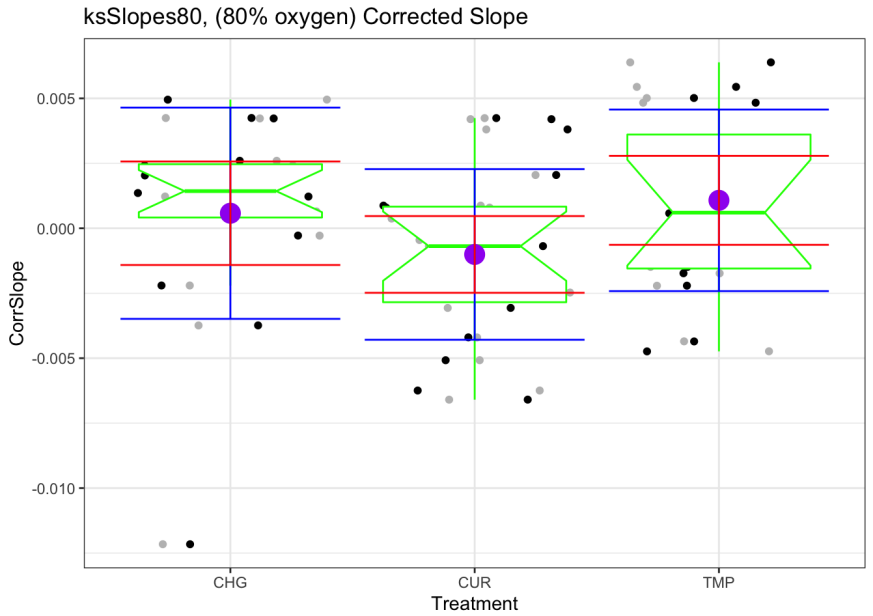


Code

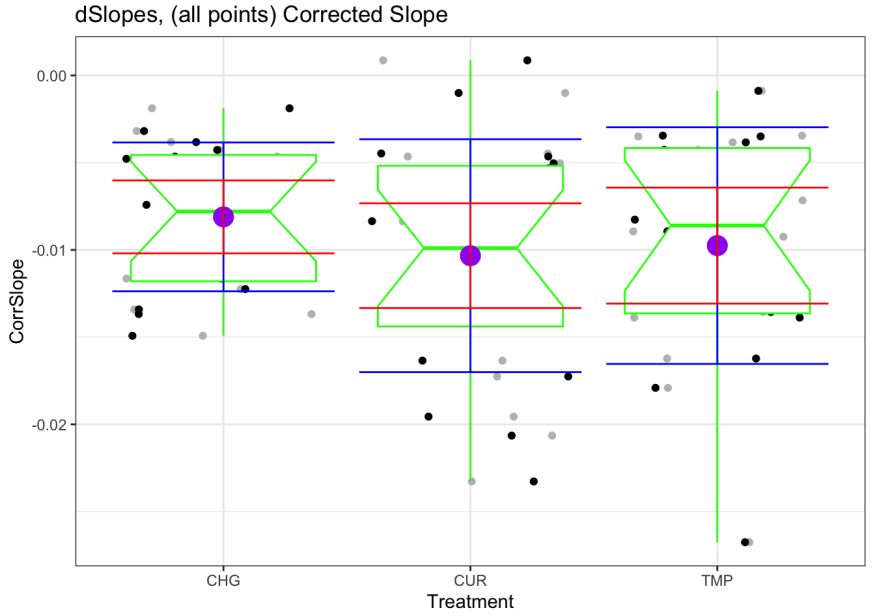
```
## notch went outside hinges. Try setting notch=FALSE.
## notch went outside hinges. Try setting notch=FALSE.
```



Code



Code



Slope Statistics

Code

	Avg All Points Corrected Slopes	Med All Points Corrected Slopes	All Points Corrected Slopes SD	Avg 80% DO Corrected Slopes	Med 80% DO Corrected Slopes	80% DO Corrected Slopes SD	Avg 70% DO Corrected Slopes	Med 70% DO Corrected Slopes	70% DO Corrected Slopes SD	Avg 1hr Corrected Slopes	Med 1hr Corrected Slopes	1hr Corrected Slopes SD
CHG	-0.0081069	-0.0077957	0.0042656	0.0005786	0.0014299	0.0040655	-0.0004976	-0.0000416	0.0031732	-0.0017762	-0.0020364	0.0055834
CUR	-0.0103312	-0.0098989	0.0066749	-0.0010072	-0.0006883	0.0032839	-0.0003071	-0.0000257	0.0022988	0.0023796	0.0010210	0.0112983
TMP	-0.0097526	-0.0086015	0.0067831	0.0010753	0.0006013	0.0034942	0.0002339	0.0004077	0.0028139	-0.0025005	-0.0036506	0.0048384

Krill Slopes 1hr Summary Table

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.0056	-0.0018	-0.0020	0.0049	16	0.0014	0.0027
CUR	0.0113	0.0024	0.0010	0.0051	19	0.0026	0.0051
TMP	0.0048	-0.0025	-0.0037	0.0057	16	0.0012	0.0024

Krill Slopes (70min cutoff) Summary Table

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.00317323	-0.00049765	-0.00004159	0.0029009	16	0.00079331	0.00155488
CUR	0.00229879	-0.00030711	-0.00002571	0.0024188	19	0.00052738	0.00103366
TMP	0.00281395	0.00023391	0.00040771	0.0038484	16	0.00070349	0.00137884

Krill Slopes (80min cutoff) Summary Table

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.00406553	0.00057855	0.00142992	0.0020522	16	0.00101638	0.00199211
CUR	0.00328389	-0.00100720	-0.00068825	0.0036778	19	0.00075338	0.00147662
TMP	0.00349420	0.00107532	0.00060128	0.0051561	16	0.00087355	0.00171216

Krill Slopes (all points) Summary Table

Code

Treatment	sd	mean	median	IQR	n	se	ci
CHG	0.00426562	-0.00810690	-0.00779566	0.0072380	16	0.00106640	0.00209015
CUR	0.00667489	-0.01033117	-0.00989889	0.0092086	19	0.00153133	0.00300140
TMP	0.00678308	-0.00975257	-0.00860152	0.0094790	16	0.00169577	0.00332371

Krill Slopes (1hr cutoff) Mixed Effects Model

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.1hr
##
## REML criterion at convergence: -329.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.68638 -0.47569  0.00437  0.51632  2.75955
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.441e-05 0.005866
##  Residual             4.178e-05 0.006464
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)   0.002713   0.003173  8.789085   0.855    0.415
## TreatmentCHG -0.004016   0.004212 14.743842  -0.953    0.356
## TreatmentTMP -0.005214   0.005467  6.253781  -0.954    0.376
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.616
## TreatmntTMP -0.580  0.357
```

Krill Slopes (80min cutoff) Mixed Effects Model

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.80
##
## REML criterion at convergence: -395.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.4943 -0.5586  0.1519  0.5739  1.4604
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 2.347e-07 0.0004845
##  Residual             1.287e-05 0.0035869
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.0010254  0.0008642  5.6876601  -1.187    0.283
## TreatmentCHG  0.0016000  0.0012697  7.5087302   1.260    0.245
## TreatmentTMP  0.0021007  0.0012916  3.8400049   1.626    0.182
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.677
## TreatmntTMP -0.669  0.453
```

Krill Slopes (70min cutoff) Mixed Effects Model

Code


```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: ksSlopes.70
##
## REML criterion at convergence: -431.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1536 -0.5207  0.1268  0.5546  1.5776
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 3.331e-06 0.001825
##  Residual             5.069e-06 0.002251
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -3.734e-04  1.025e-03  9.401e+00  -0.364    0.724
## TreatmentCHG -1.416e-05  1.384e-03  1.437e+01  -0.010    0.992
## TreatmentTMP  6.073e-04  1.742e-03  6.715e+00   0.349    0.738
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.628
## TreatmntTMP -0.589  0.370
```

Krill Slopes (all points) Mixed Effects Model

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | MOATS)
##    Data: dSlopes
##
## REML criterion at convergence: -345.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8039 -0.6542  0.1125  0.7677  1.8463
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  MOATS    (Intercept) 0.000e+00 0.000000
##  Residual             3.677e-05 0.006064
## Number of obs: 51, groups:  MOATS, 9
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.0103312  0.0013912 48.0000000  -7.426 1.64e-09 ***
## TreatmentCHG  0.0022243  0.0020576 48.0000000   1.081    0.285
## TreatmentTMP  0.0005786  0.0020576 48.0000000   0.281    0.780
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.676
## TreatmntTMP -0.676  0.457
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

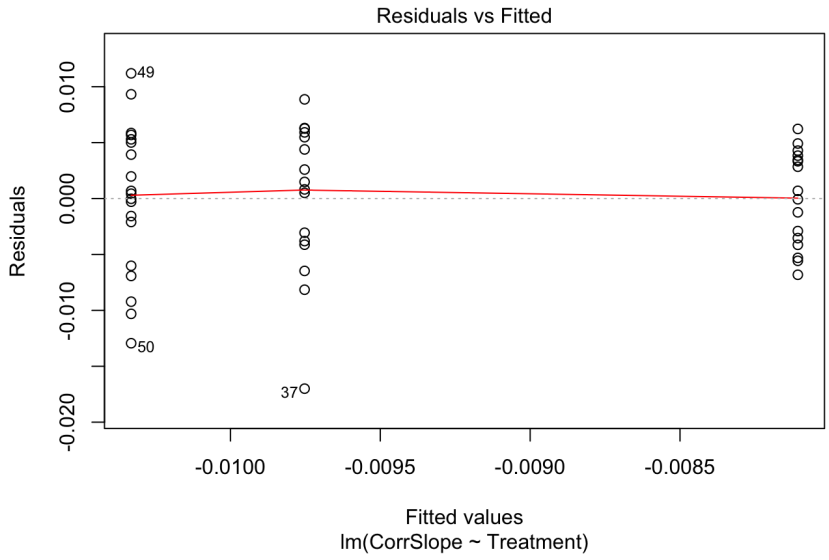
7.) Linear Models All Change Compared Against Current and High Temperature

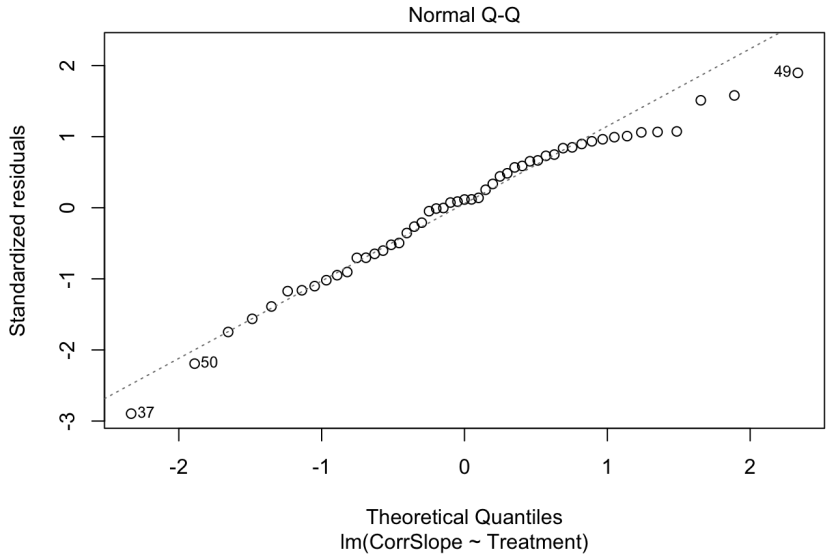
7.a) dSlopes all points

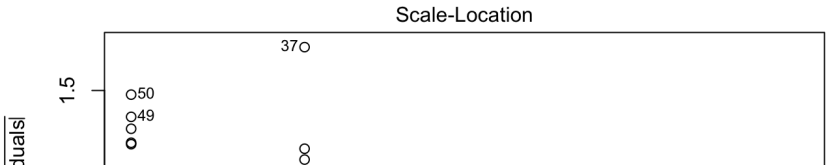
Code

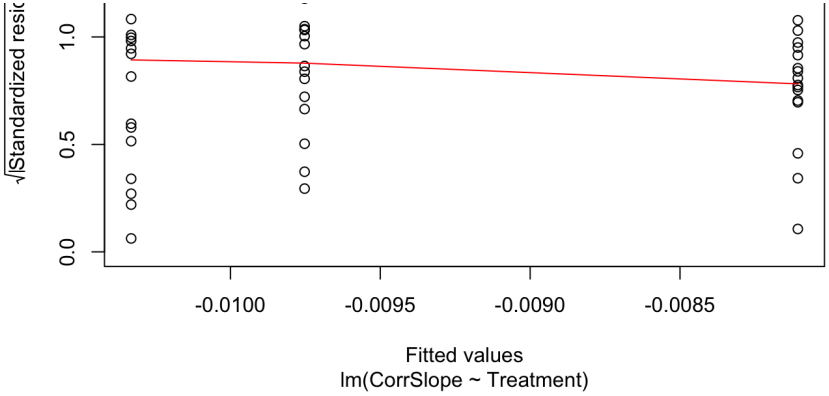
```
##
## Call:
## lm(formula = CorrSlope ~ Treatment, data = dSlopes)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0170029 -0.0039671  0.0006824  0.0046551  0.0111961
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.008107   0.001516  -5.348 2.44e-06 ***
## TreatmentCUR -0.002224   0.002058  -1.081    0.285
## TreatmentTMP -0.001646   0.002144  -0.768    0.446
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.006064 on 48 degrees of freedom
## Multiple R-squared:  0.0249, Adjusted R-squared:  -0.01572
## F-statistic: 0.613 on 2 and 48 DF,  p-value: 0.5459
```

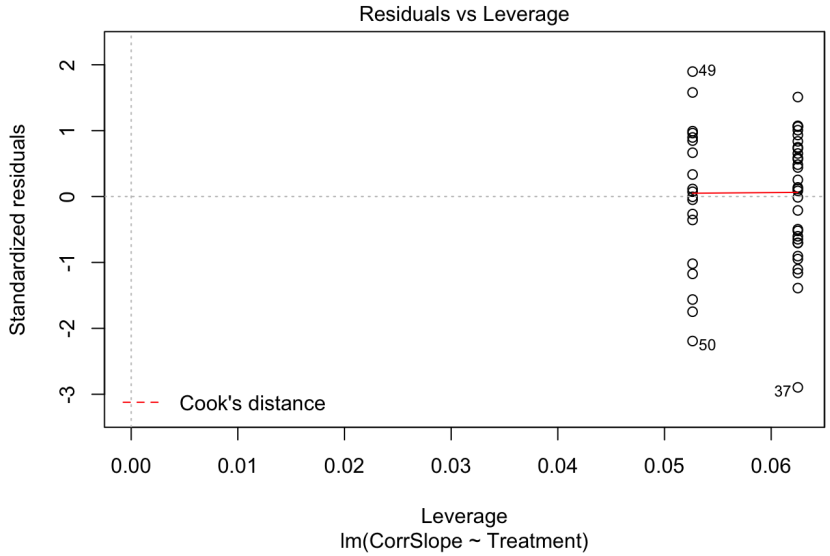
Code









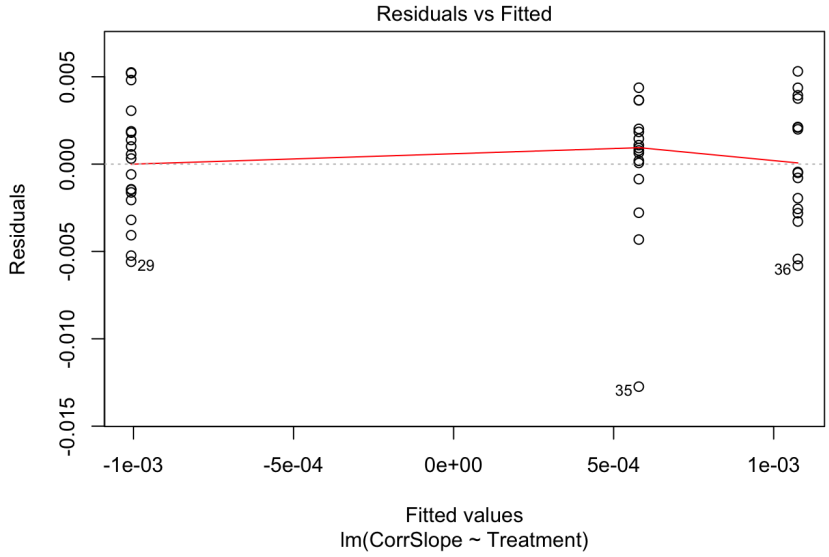


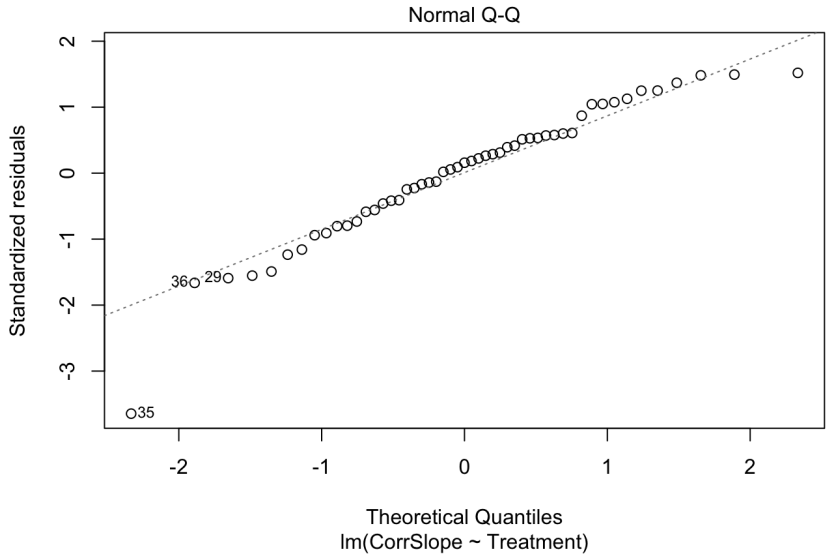
7.b) Linear Models All Change Compared Against Current and High Temperature (80%)

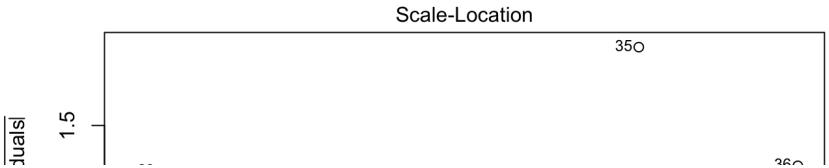
Code

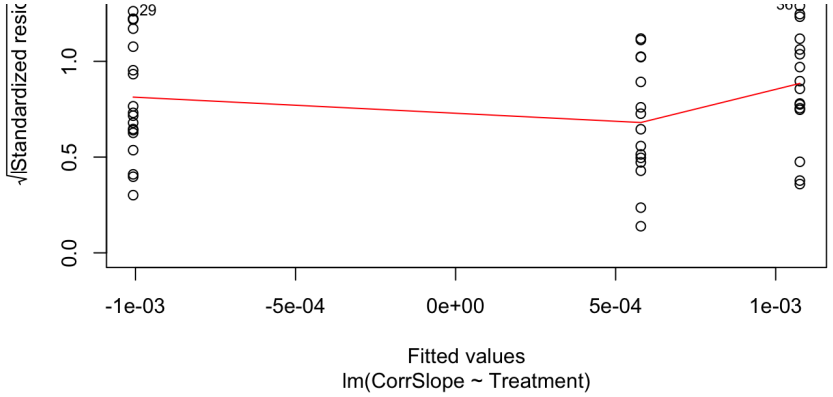
```
##
## Call:
## lm(formula = CorrSlope ~ Treatment, data = ksSlopes.80)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0127379 -0.0020040  0.0005548  0.0020571  0.0053103
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.0005786  0.0009022   0.641    0.524
## TreatmentCUR -0.0015858  0.0012246  -1.295    0.202
## TreatmentTMP  0.0004968  0.0012760   0.389    0.699
##
## Residual standard error: 0.003609 on 48 degrees of freedom
## Multiple R-squared:  0.06306,    Adjusted R-squared:  0.02402
## F-statistic: 1.615 on 2 and 48 DF,  p-value: 0.2094
```

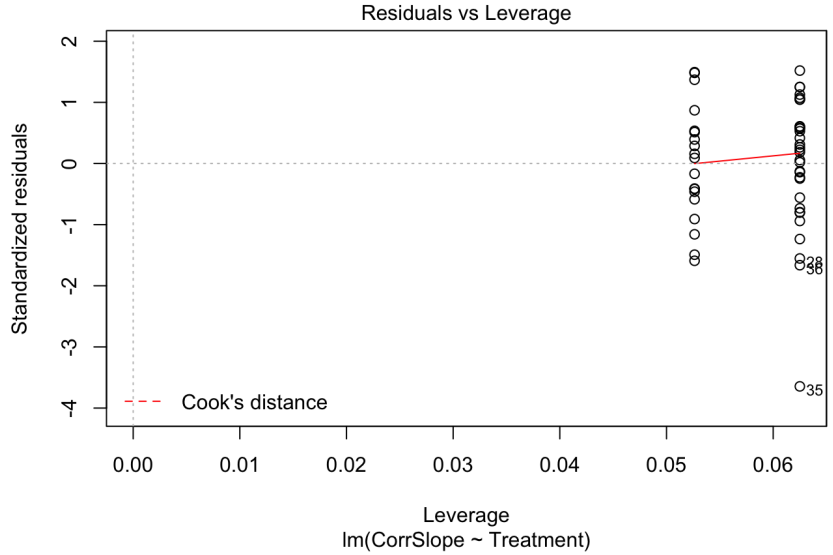
Code









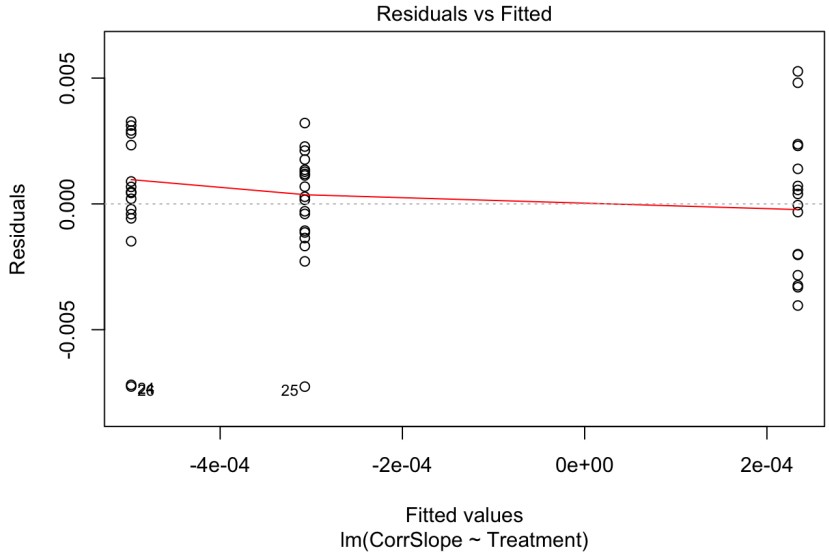


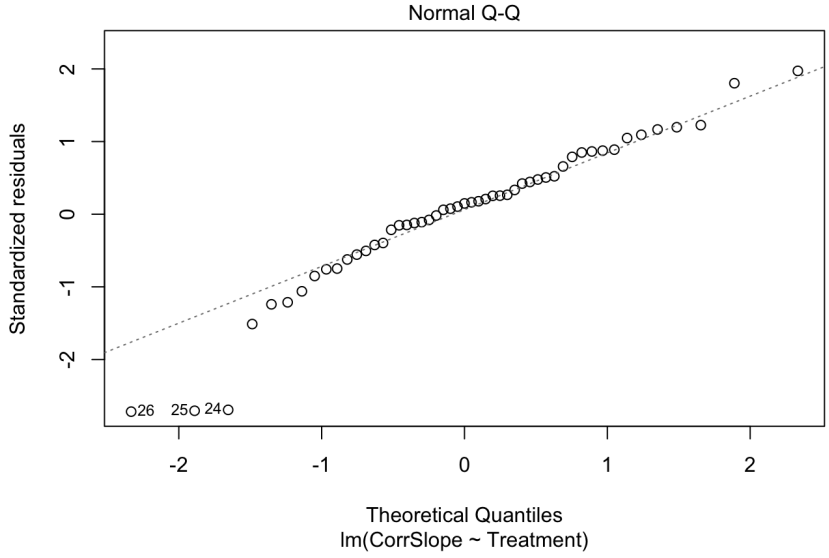
7.c) Linear Models All Change Compared Against Current and High Temperature (70%)

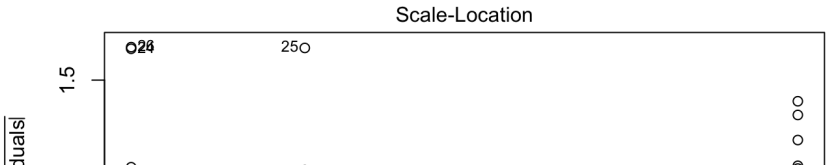
Code

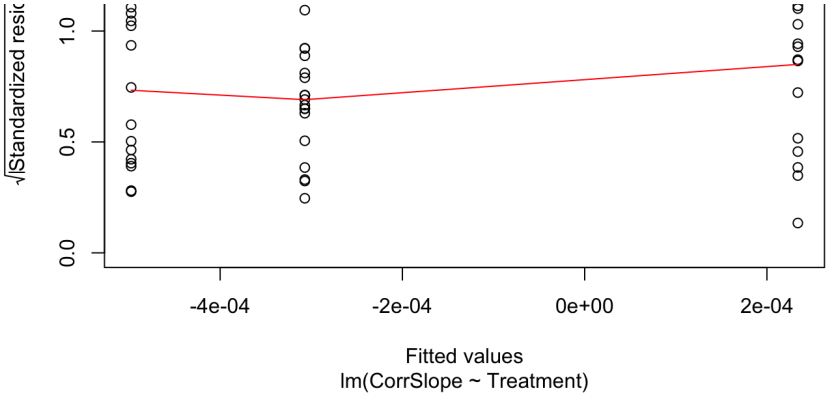
```
##
## Call:
## lm(formula = CorrSlope ~ Treatment, data = ksSlopes.70)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.007262 -0.001246  0.000396  0.001579  0.005268
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.0004976  0.0006893  -0.722    0.474
## TreatmentCUR  0.0001905  0.0009356   0.204    0.839
## TreatmentTMP  0.0007316  0.0009749   0.750    0.457
##
## Residual standard error: 0.002757 on 48 degrees of freedom
## Multiple R-squared:  0.01257,    Adjusted R-squared:  -0.02857
## F-statistic: 0.3056 on 2 and 48 DF,  p-value: 0.7381
```

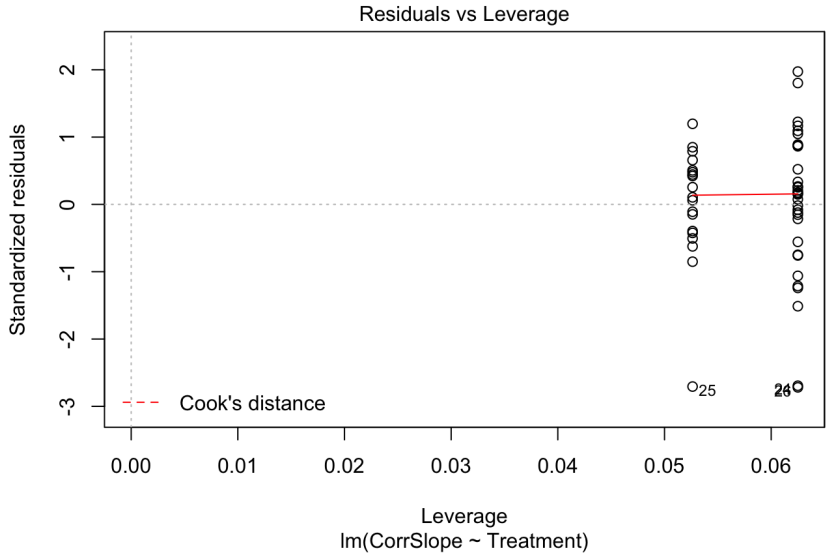
Code









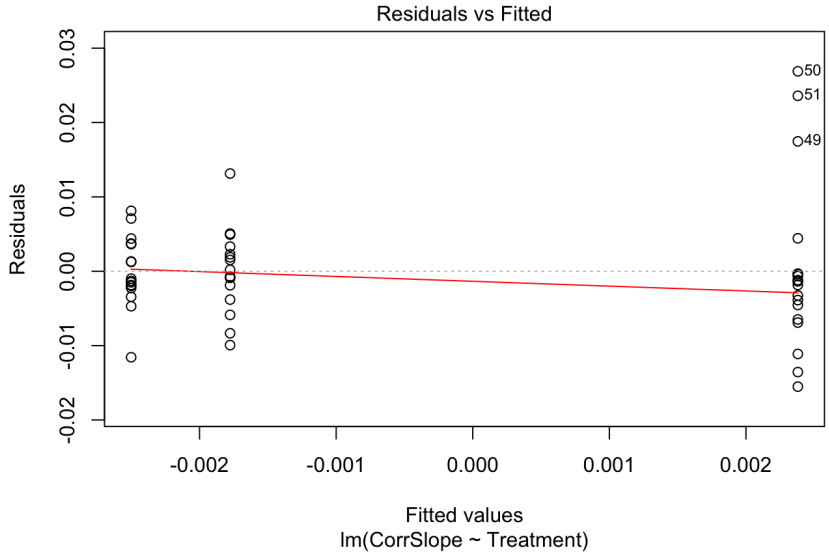


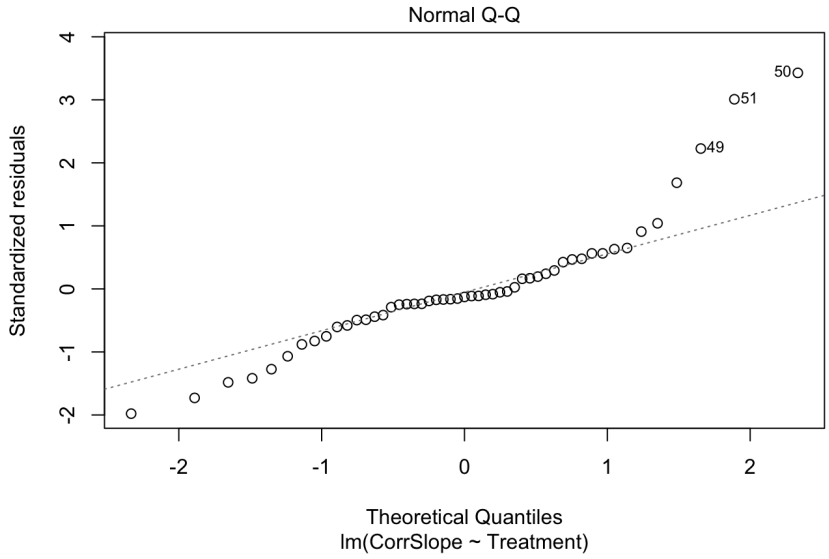
7.d) Linear Models All Change Compared Against Current and High Temperature (1hr)

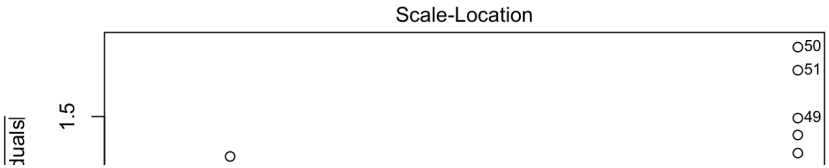
Code

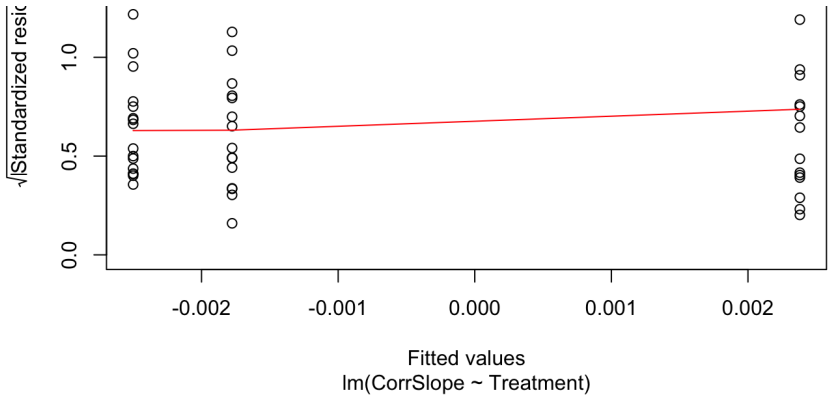
```
##
## Call:
## lm(formula = CorrSlope ~ Treatment, data = ksSlopes.1hr)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0155201 -0.0036256 -0.0009904  0.0027973  0.0268831
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.0017762  0.0020144  -0.882    0.382
## TreatmentCUR  0.0041558  0.0027341   1.520    0.135
## TreatmentTMP -0.0007243  0.0028488  -0.254    0.800
##
## Residual standard error: 0.008058 on 48 degrees of freedom
## Multiple R-squared:  0.07358,    Adjusted R-squared:  0.03498
## F-statistic: 1.906 on 2 and 48 DF,  p-value: 0.1597
```

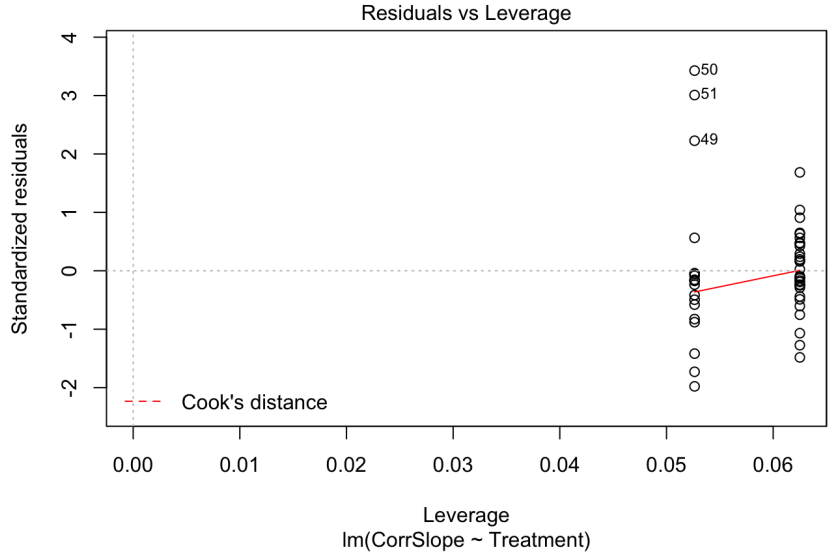
Code











Noticing that the 1hr dataset doesn't fit the model well- going to further explore the model. Maybe this just calls a difference between Trial 03 and all others

Question Times 1hr Dataset

When I write the following expression does this mean that I'm looking at the relationship of (CorrSlope ~ Treatment) of each MOATs?

Code

```
##
## Call:
## lm(formula = CorrSlope ~ Treatment + MOATS, data = ksSlopes.1hr)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015499 -0.003593 -0.001010  0.002819  0.026881
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.838e-03  3.444e-03  -0.534    0.596
## TreatmentCUR  4.141e-03  2.842e-03   1.457    0.152
## TreatmentTMP -6.904e-04  3.262e-03  -0.212    0.833
## MOATS         7.855e-06  3.555e-04   0.022    0.982
##
## Residual standard error: 0.008143 on 47 degrees of freedom
## Multiple R-squared:  0.07359,    Adjusted R-squared:  0.01446
## F-statistic: 1.245 on 3 and 47 DF,  p-value: 0.3042
```

Want to also account for Trial ID

Code

```
##
## Call:
## lm(formula = CorrSlope ~ Treatment + MOATS + TrialID, data = ksSlopes.1hr)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0115129 -0.0030919 -0.0000491  0.0035575  0.0172261
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -1.141e-05  3.756e-03  -0.003 0.997591
## TreatmentCUR   -4.801e-04  2.366e-03  -0.203 0.840144
## TreatmentTMP   -3.374e-04  2.929e-03  -0.115 0.908812
## MOATS          -2.424e-05  3.096e-04  -0.078 0.937937
## TrialIDTrial02 -3.462e-03  3.109e-03  -1.114 0.271511
## TrialIDTrial03 -4.134e-03  2.228e-03  -1.855 0.070295 .
## TrialIDTrial04  1.277e-02  3.181e-03   4.014 0.000229 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.006225 on 44 degrees of freedom
## Multiple R-squared:  0.4931, Adjusted R-squared:  0.424
## F-statistic: 7.133 on 6 and 44 DF,  p-value: 2.367e-05
```

Rather than MOATs I'll try Trial ID in my mixed effects model

9.x Trial ID

9.a 1hr Dataframe - LMER

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | TrialID)
##    Data: ksSlopes.1hr
##
## REML criterion at convergence: -335.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.7352 -0.5188  0.0019  0.5690  2.9297
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  TrialID  (Intercept) 5.545e-05 0.007446
##  Residual             3.795e-05 0.006161
## Number of obs: 51, groups:  TrialID, 4
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   0.0008465  0.0040573  3.5283105   0.209    0.846
## TreatmentCUR -0.0001233  0.0022304 45.8591286  -0.055    0.956
## TreatmentTMP -0.0002550  0.0023287 45.7104836  -0.110    0.913
##
## Correlation of Fixed Effects:
##             (Intr) TrtCUR
## TreatmntCUR -0.303
## TreatmntTMP -0.243  0.433
```

Code

"1hr Dataset" -still no Treatment Effect Found

6.b 1hr Dataframe - LMER releved Current 1st

Code

```
## NULL
```

Code

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: CorrSlope ~ Treatment + (1 | TrialID)
##    Data: ksSlopes.1hr
##
## REML criterion at convergence: -335.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.7352 -0.5188  0.0019  0.5690  2.9297
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  TrialID  (Intercept) 5.545e-05 0.007446
##  Residual             3.795e-05 0.006161
## Number of obs: 51, groups:  TrialID, 4
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   0.0007232  0.0039938  3.3189806   0.181    0.867
## TreatmentCHG  0.0001233  0.0022304 45.8591287   0.055    0.956
## TreatmentTMP -0.0001317  0.0024290 46.6524305  -0.054    0.957
##
## Correlation of Fixed Effects:
##             (Intr) TrtCHG
## TreatmntCHG -0.251
## TreatmntTMP -0.235  0.503
```

Trial Variance may not be leading vairiance determinator.

Code

END OF SCRIPT | END OF DOCUMENT