*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

Analysis 1: Anova on the Osteocytes Metrics

For this analysis I ran unbalanced, 2-way ANOVA with a blocking factor. The dependent variable is each lacunae metric, the blocking factor is each mouse (ID), and the factors are: 1) strain (PL vs AM), 2) experimental group (ground control vs flight), and 3) the interaction between strain and group. From talking with colleagues, repeated measures anova is not appropriate as each osteocyte (measurement level of interest) is not measured twice. We include each mouse as a blocking variable to control for the dependence of mouse osteocyte measurements. The global alpha level is set to 0.001.

Log Volume

A log transformation of the volume metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log volume as the dependent variable) revealed: 1) there is a significant difference in log volume for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in log volume for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 9.9e^{-11}$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log volume of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log volume of osteocytes is significantly different across the different mice ($p = 2.2e^{-16}$).

Rank Oblateness

A rank transformation of the oblateness metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with rank oblateness as the dependent variable) revealed: 1) there is a significant difference in rank oblateness for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in rank oblateness for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 4.1e^{-08}$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the rank oblateness of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the rank oblateness of osteocytes is significantly different across the different mice ($p = 2.2e^{-16}$).

Log Surface Area

A log transformation of the surface area metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log surface area as the dependent variable) revealed: 1) there is a significant

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difference in log surface area for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in log surface area for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 1.5e^{-06}$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log surface area of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log surface area of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Log Aspect Ratio

A log transformation of the aspect ratio metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log aspect ratio as the dependent variable) revealed: 1) there is a significant difference in log aspect ratio for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in log aspect ratio for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 0.011$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log aspect ratio of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log aspect ratio of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Rank Stretch

A rank transformation of the stretch metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with rank stretch as the dependent variable) revealed: 1) there is a significant difference in rank stretch for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in rank stretch for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 2.2e^{-16}$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the rank stretch of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the rank stretch of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Log Width

A log transformation of the width metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log width as the dependent variable) revealed: 1) there is a significant difference in log width for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in log width for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 2.2e^{-16}$), 3) where an osteocyte is

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in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log width of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log width of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Rank Fitted Ellipsoid Volume

A rank transformation of the fitted ellipsoid volume metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with rank fitted ellipsoid volume as the dependent variable) revealed: 1) there is a significant difference in rank fitted ellipsoid volume for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is a significant difference in rank fitted ellipsoid volume for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 4.3e^{-06}$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the rank fitted ellipsoid volume of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the rank fitted ellipsoid volume of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Log Length

A log transformation of the length metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log length as the dependent variable) revealed: 1) there is **NOT** a significant difference in log length for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 0.66$), 2) there is **NOT** a significant difference in log length for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 0.35$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log length of an osteocyte on average ($p = 0.00297$), and 4) the log length of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Log Height

A log transformation of the height metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log height as the dependent variable) revealed: 1) there is a significant difference in log height for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-06}$), 2) there is **NOT** a significant difference in log height for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 0.11$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log height of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log height of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

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Log Fitted Ellipsoid Surface Area

A log transformation of the fitted ellipsoid surface area metric was performed to normalize the residuals of the anova test; this allows us to use/proceed with a parametric hypothesis test. Implementing the ANOVA test (with log fitted ellipsoid surface area as the dependent variable) revealed: 1) there is a significant difference in log fitted ellipsoid surface area for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is **NOT** a significant difference in log fitted ellipsoid surface area for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 0.12$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the log fitted ellipsoid surface area of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the log fitted ellipsoid surface area of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Sphericity

No transformation of the dependent variable was needed; all assumptions checked out to use a parametric test. Implementing the ANOVA test (with sphericity as the dependent variable) revealed: 1) there is a significant difference in sphericity for osteocytes in the PL region vs osteocytes in the AM region on average ($p = 2.2e^{-16}$), 2) there is **NOT** a significant difference in sphericity for osteocytes (or osteocytes in mice) in the flight group vs osteocytes in the ground control group on average ($p = 0.82$), 3) where an osteocyte is in the bone (AM vs PL region), and whether the mouse (or osteocyte) is in the ground vs control group effects the sphericity of an osteocyte on average ($p = 2.2e^{-16}$), and 4) the sphericity of an osteocyte is significantly different across the different mice ($p = 2.2e^{-16}$).

Analysis 2: Linear Multilevel Modeling of Osteocyte Metrics

A linear mixed effects model was constructed for each osteocyte metric. Because the ANOVA test for each lacunae metric showed a significant interaction factor, the models have one, 4 level predictor named ‘Interaction’. The one, four level predictor takes on values 1, 2, 3, and 4. A value of 1 corresponds to the data coming from osteocytes in the flight group and the AM region. A value of 2 corresponds to the data coming from osteocytes in the flight group and the PL region. A value of 3 corresponds to the data coming from osteocytes in the ground group and the AM region. A value of 1 corresponds to the data coming from osteocytes in the ground group

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and the PL region. The random effect in each model are the different mice (i.e. we account for the fact that each mouse has biological variation and that each mouse is likely to have different ranges of values for the same osteocyte metric). These models provide insights on how each osteocyte metric changes depending on the strain and loading factors. Transformations are performed on the dependent variables (lacunae metrics) to help normalize residuals, allowing us to use multilevel models and ANOVA.

Log Volume

A summary output of the model is as follows:

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Volume..µm..) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 90240.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.8293 -0.4506  0.0857  0.6120  8.2012

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.00425  0.06519
 Residual             0.21721  0.46606
Number of obs: 68785, groups:  id, 8

Fixed effects:
              Estimate Std. Error t value
(Intercept)   5.508061   0.032796 167.951
Interaction2 -0.011560   0.005189  -2.228
Interaction3  0.096971   0.046356   2.092
Interaction4 -0.083450   0.046390  -1.799

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.077
Interactin3 -0.707  0.055
Interactin4 -0.707  0.054  0.994
```

Interpreting the model coefficients:

1. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log volume of 5.5 units.
2. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with a decrease in log volume of about 0.01 units. (I am unsure of the units of everything currently).

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3. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log volume of about 0.10 units.
4. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log volume of about 0.08 units.

Interpreting the contrasts of interest for this model:

1. The AMGround group has a 0.097 higher average log volume than the AMFlight group. The standard error is 0.046 and the t value is 2.092. The difference between the AMGround group and the AMFlight group is significantly different since the 95% CI (0.097 +/- 2*standard error) does not cover 0.
2. The AMFlight group has a 0.012 higher average log volume than the PLFlight group. The standard error is 0.005 and the t value is -2.23. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.012 +/- 2*standard error) does not cover 0.
3. The PLFlight group has a 0.07 higher average log volume than the PLGround group. The standard error is 0.046397 and the t value is 1.55. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.07 +/- 2*standard error) covers 0.
4. The AMGround group has a 0.180 higher average log volume than the PLGround group. The standard error is 0.004959 and the t value is 36.38. The difference between the AMGround group and the PLGround group is not significantly different since the 95% CI (0.180 +/- 2*standard error) covers 0.

<u>Rank Oblateness</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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```
Linear mixed model fit by REML ['lmerMod']
Formula: rank(Lacuna.Oblateness..Untested...NA.) ~ Interaction + (1 |      id)
   Data: lacundf

REML criterion at convergence: 1555843

Scaled residuals:
     Min       1Q   Median       3Q      Max
-1.97874 -0.86314 -0.00152  0.86167  1.95435

Random effects:
 Groups   Name        Variance  Std.Dev.
 id       (Intercept)   2953896  1719
 Residual             389914079 19746
Number of obs: 68785, groups:  id, 8

Fixed effects:
             Estimate Std. Error t value
(Intercept)   32836.6      872.9  37.619
Interaction2   4200.4      219.9  19.105
Interaction3   1009.1     1232.8   0.819
Interaction4    916.6     1235.1   0.742

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.123
Interactin3 -0.708  0.087
Interactin4 -0.707  0.087  0.986
```

Interpreting the model coefficients:

5. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean rank oblateness of 32836.6 units.
6. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase of rank oblateness by about 4200.4 units. (I am unsure of the units of everything currently).
7. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in rank oblateness of about 1009.1 units.
8. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with an increase in rank oblateness of about 916.6 units.

Interpreting the contrasts of interest for this model:

5. The AMGround group has a 1009.1 higher average rank oblateness than the AMFlight group. The standard error is 1232.8. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (1009.1 +/- 2*standard error) covers 0.

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6. The PLFlight group has a 4200.4 higher average rank oblateness than the AMFlight group. The standard error is 219.9. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (4200.4 +/- 2*standard error) does not cover 0.
7. The PLFlight group has a 3283.73 higher average rank oblateness than the PLGround group. The standard error is 1235.59. The difference between the PLFlight group and the PLGround group is significantly different since the 95% CI (3283.73 +/- 2*standard error) does not cover 0.
8. The AMGround group has a 92.49 higher average rank oblateness than the PLGround group. The standard error is 210.11 The difference between the AMGround group and the PLGround group is not significantly different since the 95% CI (92.49 +/- 2*standard error) covers 0.

<u>Log Surface Area</u>

A summary output of the model is as follows:

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Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Surface.Area..Lindblad.2005...µm..) ~ Interaction + (1 |      id)
   Data: lacundf

REML criterion at convergence: 51726.5

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.2798 -0.5061  0.0393  0.5734  9.4294

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.002855 0.05343
 Residual             0.124076 0.35224
Number of obs: 68785, groups:  id, 8

Fixed effects:
             Estimate Std. Error t value
(Intercept)   5.676349   0.026856 211.361
Interaction2  0.026403   0.003922   6.732
Interaction3  0.071317   0.037964   1.879
Interaction4 -0.034425   0.037987  -0.906

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.071
Interactin3 -0.707  0.050
Interactin4 -0.707  0.050  0.995
```

Interpreting the model coefficients:

9. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log surface area of 5.68 units.
10. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase of log surface area by about 0.03 units. (I am unsure of the units of everything currently).
11. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log surface area of about 0.07 units.
12. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log surface area of about -0.03 units.

Interpreting the contrasts of interest for this model:

9. The AMGround group has a 0.071317 higher average log surface area than the AMFlight group. The standard error is 0.027. The difference between the AMGround group and the

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AMFlight group is significantly different since the 95% CI (0.071317 +/- 2*standard error) does not cover 0.

10. The PLFlight group has a 0.026403 higher average log surface area than the AMFlight group. The standard error is 0.004. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.026403 +/- 2*standard error) does not cover 0.
11. The PLFlight group has a 0.060828 higher average log surface area than the PLGround group. The standard error is 0.039. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.060828 +/- 2*standard error) covers 0.
12. The AMGround group has a 0.105742 higher average log surface area than the PLGround group. The standard error is 0.004 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.105742 +/- 2*standard error) does not cover 0.

Log Aspect Ratio

A summary output of the model is as follows:

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Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Aspect.Ratio..NA.) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 99533

Scaled residuals:
    Min      1Q  Median      3Q     Max
-6.9474 -0.6695 -0.0075  0.7259  2.9245

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.002571 0.05071
 Residual             0.248643 0.49864
Number of obs: 68785, groups:  id, 8

Fixed effects:
             Estimate Std. Error t value
(Intercept)  -1.628885   0.025646 -63.514
Interaction2  0.021420   0.005552   3.858
Interaction3  0.069730   0.036234   1.924
Interaction4 -0.050005   0.036283  -1.378

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.105
Interactin3 -0.708  0.075
Interactin4 -0.707  0.075  0.989
```

Interpreting the model coefficients:

13. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log aspect ratio of -1.63 units.
14. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase in aspect ratio by about 0.02 units. (I am unsure of the units of everything currently).
15. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log aspect ratio of about 0.07 units.
16. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log aspect ratio of about -0.05 units.

Interpreting the contrasts of interest for this model:

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13. The AMGround group has a 0.069730 higher average log aspect ratio than the AMFlight group. The standard error is 0.036. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (0.069730 +/- 2*standard error) covers 0.
14. The PLFlight group has a 0.021420 higher average log aspect ratio than the AMFlight group. The standard error is 0.006. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.021420 +/- 2*standard error) does not cover 0.
15. The PLFlight group has a 0.071425 higher average log aspect ratio than the PLGround group. The standard error is 0.036. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.071425 +/- 2*standard error) covers 0.
16. The AMGround group has a 0.119735 higher average log aspect ratio than the PLGround group. The standard error is 0.005 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.119735 +/- 2*standard error) does not cover 0.

<u>Rank Stretch</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: rank(Lacuna.Stretch..Untested...NA.) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 1552454

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.17334 -0.82834  0.01972  0.84585  2.29493

Random effects:
 Groups   Name        Variance  Std.Dev.
 id       (Intercept)   7407295  2722
 Residual             371137760 19265
Number of obs: 68785, groups:  id, 8

Fixed effects:
             Estimate Std. Error t value
(Intercept)   32915.6     1369.0  24.044
Interaction2   5667.3      214.5  26.420
Interaction3  -3497.4     1935.1  -1.807
Interaction4   5871.5     1936.4   3.032

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.076
Interactin3 -0.707  0.054
Interactin4 -0.707  0.054  0.994
```

Interpreting the model coefficients:

17. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean rank stretch of 32915.6 units.
18. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase in rank stretch by about 5667.3 units. (I am unsure of the units of everything currently).
19. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with a decrease in rank stretch of about 3497.4 units.
20. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with an increase in rank stretch of about 5871.5 units.

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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Interpreting the contrasts of interest for this model:

17. The AMFlight group has a 3497.4 higher average rank stretch than the AMGround group. The standard error is 1935.1. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (3497.4 +/- 2*standard error) covers 0.
18. The PLFlight group has a 5667.3 higher average rank stretch than the AMFlight group. The standard error is 214.5. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (5667.3 +/- 2*standard error) does not cover 0.
19. The PLGround group has a 204.1 higher average rank stretch than the PLFlight group. The standard error is 1936.7. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (204.1 +/- 2*standard error) covers 0.
20. The PLGround group has a 9368.8 higher average rank stretch than the AMGround group. The standard error is 205.0 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (9368.8 +/- 2*standard error) does not cover 0.

<u>Log Width</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Lacuna.Width..Untested...µm.) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 4252.4

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.8034 -0.6167 -0.0523  0.5918  7.4001

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.001291 0.03593
 Residual             0.062221 0.24944
Number of obs: 68785, groups:  id, 8

Fixed effects:
               Estimate Std. Error  t value
(Intercept)  -12.774896   0.018069 -707.015
Interaction2  -0.080282   0.002777  -28.905
Interaction3   0.059809   0.025541    2.342
Interaction4  -0.089279   0.025558   -3.493

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.075
Interactin3 -0.707  0.053
Interactin4 -0.707  0.053  0.995
```

Interpreting the model coefficients:

21. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log width of -12.77 units.
22. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with a decrease in log width by about 0.08 units. (I am unsure of the units of everything currently).
23. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log width of about 0.06 units.
24. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log width of about 0.09 units.

Interpreting the contrasts of interest for this model:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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21. The AMGround group has a 0.059809 higher average log width than the AMFlight group. The standard error is 0.0255. The difference between the AMGround group and the AMFlight group is significantly different since the 95% CI (0.059809 +/- 2*standard error) does not cover 0.
22. The AMFlight group has a 0.080282 higher average log width than the PLFlightgroup. The standard error is 0.003. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.080282 +/- 2*standard error) does not cover 0.
23. The PLFlight group has a 0.008997 higher average log width than the PLGround group. The standard error is 0.023. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.008997 +/- 2*standard error) covers 0.
24. The AMGround group has a 0.149087 higher average log width than the PLGround group. The standard error is 0.003 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.149087 +/- 2*standard error) does not cover 0.

<u>Rank Fitted Ellipsoid Volume</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: rank(Fitted.Ellipsoid.Volume..Untested...µm..) ~ Interaction +
    (1 | id)
   Data: lacundf

REML criterion at convergence: 1552936

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.25175 -0.82347  0.01064  0.85779  2.17569

Random effects:
 Groups   Name        Variance  Std.Dev.
 id       (Intercept)  11873478  3446
 Residual             373731602 19332
Number of obs: 68785, groups:  id, 8

Fixed effects:
             Estimate Std. Error t value
(Intercept)   34287.7     1729.4  19.826
Interaction2   -769.2      215.3  -3.573
Interaction3   4214.8     2445.0   1.724
Interaction4  -4847.5     2446.1  -1.982

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.061
Interactin3 -0.707  0.043
Interactin4 -0.707  0.043  0.996
```

Interpreting the model coefficients:

25. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log fitted ellipsoid volume of 34287.7 units.
26. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with a decrease in log fitted ellipsoid volume by about 769.2 units. (I am unsure of the units of everything currently).
27. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log fitted ellipsoid volume of about 4214.8 units.
28. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log fitted ellipsoid volume of about 4847.5 units.

Interpreting the contrasts of interest for this model:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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25. The AMGround group has a 4214.8 higher average rank fitted ellipsoid volume than the AMFlight group. The standard error is 2445.0. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (4214.8 +/- 2*standard error) covers 0.
26. The PLFlight group has a 769.2 higher average rank fitted ellipsoid volume than the AMFlight group. The standard error is 215.3. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (769.2 +/- 2*standard error) does not cover 0.
27. The PLFlight group has a 4078.3 higher average rank fitted ellipsoid volume than the PLGround group. The standard error is 2446.3. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (4078.3 +/- 2*standard error) covers 0.
28. The AMGround group has a 9062.3 higher average rank fitted ellipsoid volume than the PLGround group. The standard error is 205.7 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (9062.3 +/- 2*standard error) does not cover 0.

<u>Log Length</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Lacuna.Length..Untested...µm.) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 4335.2

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.6747 -0.5668  0.0678  0.6228  9.3926

Random effects:
 Groups   Name        Variance  Std.Dev.
 id       (Intercept) 0.0006471 0.02544
 Residual             0.0622992 0.24960
Number of obs: 68785, groups:  id, 8

Fixed effects:
               Estimate Std. Error  t value
(Intercept)  -1.120e+01  1.287e-02 -870.591
Interaction2  7.444e-03  2.779e-03    2.679
Interaction3  3.903e-03  1.818e-02    0.215
Interaction4 -4.749e-05  1.820e-02   -0.003

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.105
Interactin3 -0.708  0.074
Interactin4 -0.707  0.074  0.989
```

Interpreting the model coefficients:

29. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log length of -11.2 units.
30. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase in log length by about 0.01 units. (I am unsure of the units of everything currently).
31. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log length of about 0.004 units.
32. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log length of about 4.749e-05 units.

Interpreting the contrasts of interest for this model:

29. The AMGround group has a 0.003903 higher average log length than the AMFlight group. The standard error is .0182. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (0.003903 +/- 2*standard error) covers 0.

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

30. The PLFlight group has a 0.007444 higher average log length than the AMFlight group. The standard error is 0.002779. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.007444 +/- 2*standard error) does not cover 0.
31. The PLFlight group has a 0.007492 higher average log length than the PLGround group. The standard error is 0.01821. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.007492 +/- 2*standard error) covers 0.
32. The AMGround group has a 0.003951 higher average log length than the PLGround group. The standard error is 0.0027 The difference between the AMGround group and the PLGround group is not significantly different since the 95% CI (0.003951 +/- 2*standard error) covers 0.

Log Height

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Lacuna.Height..Untested...µm.) ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: 2248.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.4683 -0.6324 -0.0285  0.6059  8.4286

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.001215 0.03486
 Residual             0.060434 0.24583
Number of obs: 68785, groups:  id, 8

Fixed effects:
               Estimate Std. Error  t value
(Intercept)  -12.026707   0.017536 -685.839
Interaction2   0.043788   0.002737   15.997
Interaction3   0.040126   0.024787    1.619
Interaction4  -0.015565   0.024804   -0.627

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.076
Interactin3 -0.707  0.054
Interactin4 -0.707  0.054  0.994
```

Interpreting the model coefficients:

33. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log height of -12.03 units.
34. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase in log height by about 0.04 units. (I am unsure of the units of everything currently).
35. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log height of about 0.04 units.
36. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log height of about 0.02 units.

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

Interpreting the contrasts of interest for this model:

33. The AMGround group has a 0.040126 higher average log height than the AMFlight group. The standard error is .025. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (0.040126 +/- 2*standard error) covers 0.
34. The PLFlight group has a 0.043788 higher average log height than the AMFlight group. The standard error is .003. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.043788 +/- 2*standard error) does not cover 0.
35. The PLFlight group has a 0.059352 higher average log height than the PLGround group. The standard error is 0.025. The difference between the PLFlight group and the PLGround group is significantly different since the 95% CI (0.059352 +/- 2*standard error) does not cover 0.
36. The AMGround group has a 0.055691 higher average log height than the PLGround group. The standard error is 0.003 The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.055691 +/- 2*standard error) does not cover 0.

<u>Log Fitted Ellipsoid Surface Area</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: log(Fitted.Ellipsoid.Surface.Area..Untested...µm..) ~ Interaction +
    (1 | id)
   Data: lacundf

REML criterion at convergence: 48040.2

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.3324 -0.5148  0.0199  0.5557 12.3932

Random effects:
 Groups   Name        Variance Std.Dev.
 id       (Intercept) 0.00238  0.04879
 Residual             0.11760  0.34293
Number of obs: 68785, groups:  id, 8

Fixed effects:
               Estimate Std. Error  t value
(Intercept)  -21.164485   0.024537 -862.550
Interaction2   0.022665   0.003818    5.936
Interaction3   0.053337   0.034683    1.538
Interaction4  -0.036295   0.034708   -1.046

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.076
Interactin3 -0.707  0.054
Interactin4 -0.707  0.054  0.994
```

Interpreting the model coefficients:

37. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean log fitted ellipsoid surface area of -21.16 units.
38. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with an increase in log fitted ellipsoid surface area by about 0.02 units. (I am unsure of the units of everything currently).
39. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with an increase in log fitted ellipsoid surface area of about 0.05 units.

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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40. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in log fitted ellipsoid surface area of about 0.04 units.

Interpreting the contrasts of interest for this model:

37. The AMGround group has a 0.053337 higher average log fitted ellipsoid surface area than the AMFlight group. The standard error is .035. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (0.053337 +/- 2*standard error) covers 0.
38. The PLFlight group has a 0.022665 higher average log fitted ellipsoid surface area than the AMFlight group. The standard error is .004. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.022665 +/- 2*standard error) does not cover 0.
39. The PLFlight group has a 0.058961 higher average log fitted ellipsoid surface area than the PLGround group. The standard error is 0.035. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.058961 +/- 2*standard error) covers 0.
40. The AMGround group has a 0.089633 higher average log fitted ellipsoid surface area than the PLGround group. The standard error is 0.004. The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.089633 +/- 2*standard error) does not cover 0.

<u>Sphericity</u>

A summary output of the model is as follows:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

```
Linear mixed model fit by REML ['lmerMod']
Formula: Sphericity..Untested...NA. ~ Interaction + (1 | id)
   Data: lacundf

REML criterion at convergence: -224952.3

Scaled residuals:
    Min      1Q  Median      3Q     Max
-6.5227 -0.5367  0.0590  0.6265  4.6345

Random effects:
 Groups   Name        Variance  Std.Dev.
 id       (Intercept) 4.616e-05 0.006794
 Residual             2.222e-03 0.047136
Number of obs: 68785, groups:  id, 8

Fixed effects:
               Estimate Std. Error t value
(Intercept)   0.4498664  0.0034166 131.673
Interaction2 -0.0110202  0.0005248 -20.998
Interaction3 -0.0028706  0.0048294  -0.594
Interaction4 -0.0073531  0.0048327  -1.522

Correlation of Fixed Effects:
            (Intr) Intrc2 Intrc3
Interactin2 -0.075
Interactin3 -0.707  0.053
Interactin4 -0.707  0.053  0.995
```

Interpreting the model coefficients:

41. Intercept (AMFlight): Osteocytes that experience microgravity and are in the AM region have a mean sphericity of 0.45 units.
42. Interaction2 (PLFlight): Osteocytes that experience microgravity in the PL region are associated with a decrease in sphericity by about 0.01 units. (I am unsure of the units of everything currently).
43. Interaction3 (AMGround): Osteocytes that experience full effects of gravity and are in the AM region are associated with a decrease in sphericity of about 0.003 units.
44. Interaction4 (PLGround): Osteocytes that experience full effects of gravity and are in the PL region are associated with a decrease in sphericity of about 0.007 units.

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

Interpreting the contrasts of interest for this model:

41. The AMFlight group has a 0.0028706 higher average sphericity than the AMGround group. The standard error is .005. The difference between the AMGround group and the AMFlight group is not significantly different since the 95% CI (0.0028706 +/- 2*standard error) covers 0.
42. The AMFlight group has a 0.0110202 higher average sphericity than the PLFlight group. The standard error is .001. The difference between the PLFlight group and the AMFlight group is significantly different since the 95% CI (0.0110202 +/- 2*standard error) does not cover 0.
43. The PLGround group has a 0.0036671 higher average sphericity than the PLFlight group. The standard error is 0.035. The difference between the PLFlight group and the PLGround group is not significantly different since the 95% CI (0.0036671 +/- 2*standard error) covers 0.
44. The AMGround group has a 0.0044825 higher average sphericity than the PLGround group. The standard error is 0.001. The difference between the AMGround group and the PLGround group is significantly different since the 95% CI (0.0044825 +/- 2*standard error) does not cover 0.

Analysis 3: Semivariograms of Osteocyte Metrics by Strain and Loading

Semivariograms were constructed which determined how similar osteocytes are in terms of length, volume, oblateness, stretch, width, etc as a function of distance. In other words, it might be hypothesized that osteocytes that are closer together in the bone have more similar volume measurements then osteocytes further apart in the bone. To calculate semivariograms by strain and loading: I 1) constructed a smoothed variogram function for each mouse in each region (PL vs AM), 2) then averaged 4 smoothed curves according to 2 levels of the strain variable and the loading variable. This produces 4 semivariograms for each osteocyte metric: 1) AMFlight, 2) PLFlight, 3) AMGround, and 4) PLGround. There are 4 mice represented in each plot.

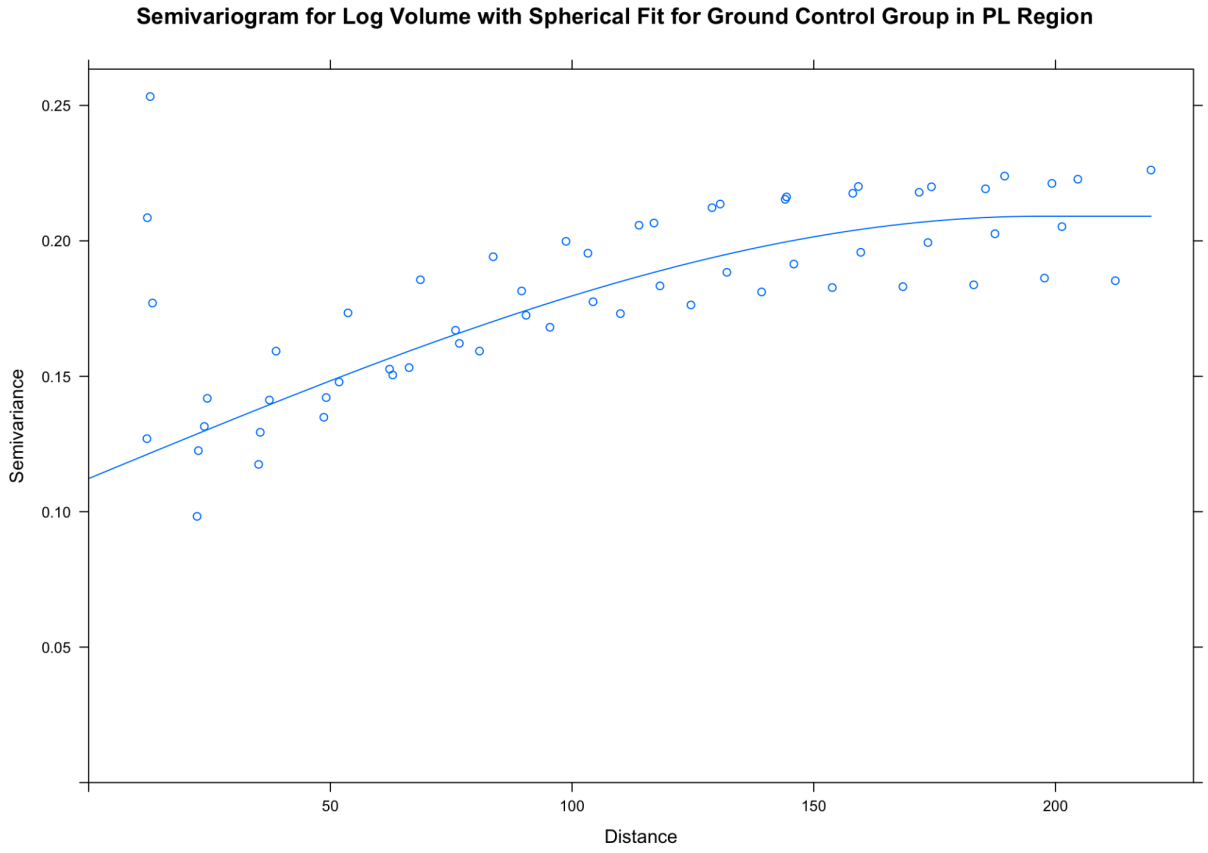
A more concise and easily comparative version of the plots can be found here:
Results_Semivariograms

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick
******* One large limitation to acknowledge regarding these semivariogram plots is that the smoothed function / curve fails to predict that there is high semivariance (homogeneity) when the 2 osteocytes are at small distances from each other. In other words, in most cases the functions predict that osteocytes are the least similar at small distances and the most similar at larger distances. *******

LOG VOLUME

1 PL Ground



How to Interpret the Plot:

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

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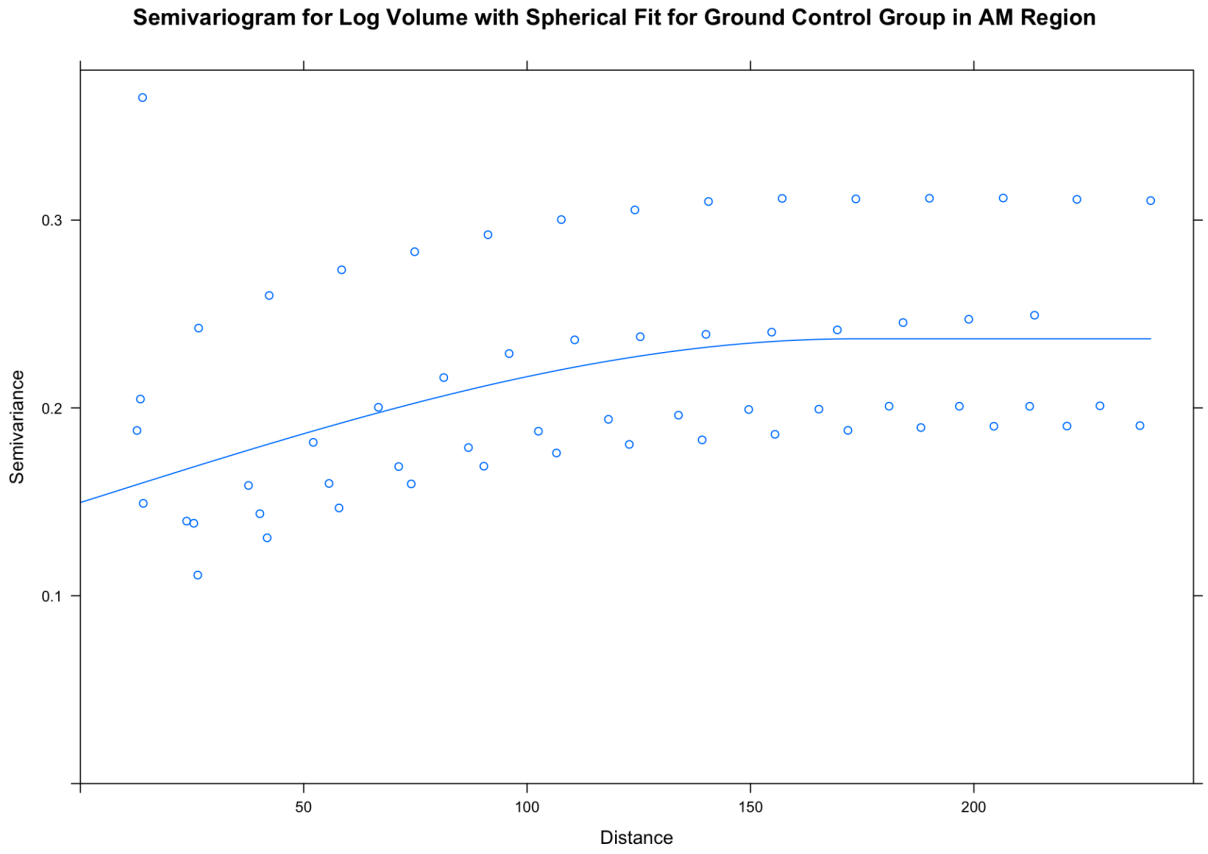
The log volume of osteocytes that experience the full effects of gravity and are in the PL region of the bone are the most similar (i.e. communicate with each other the most) when the osteocytes are the furthest away from each other. The similarity of the log volume of osteocytes increases rapidly with increasing distances (i.e. when osteocytes get further away from each other) and then levels off at about a distance of 150.

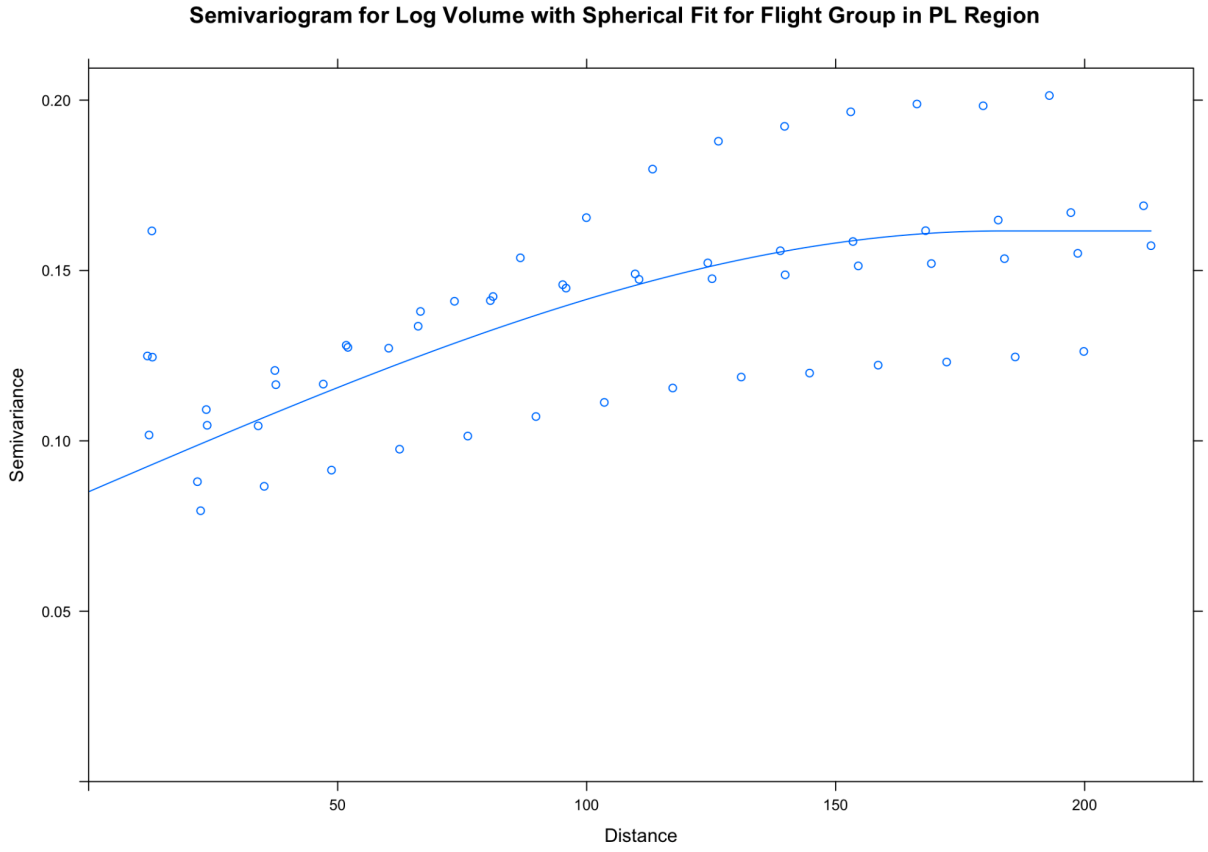
2 AM Ground



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

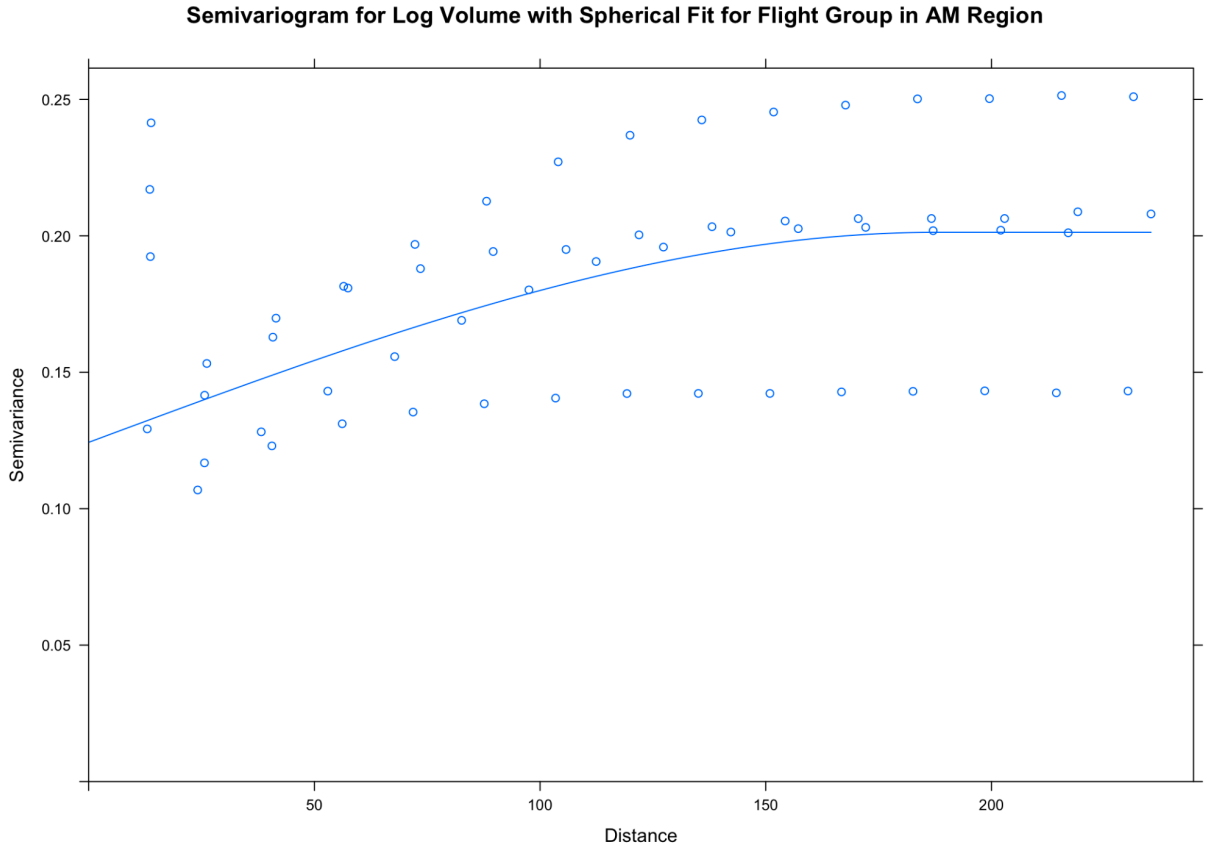
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

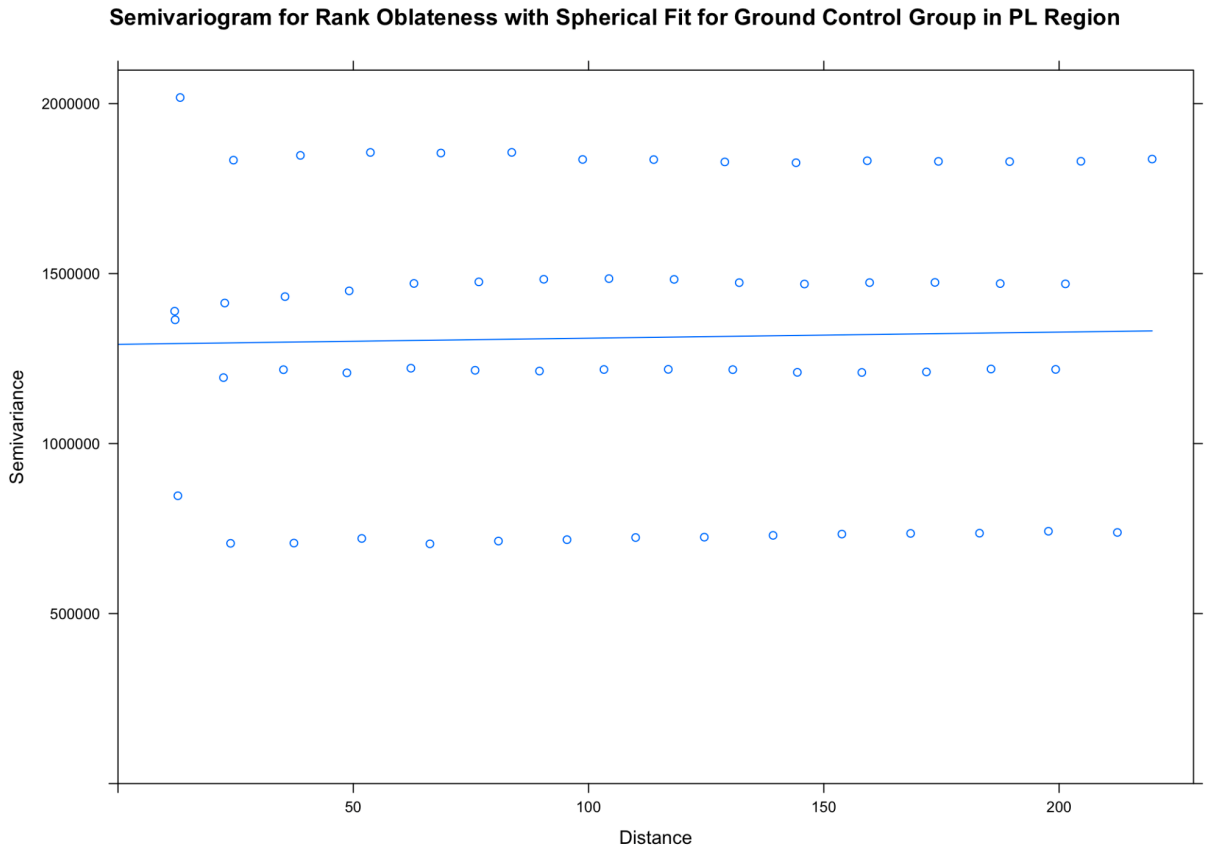


<u>RANK OBLATENESS</u>

<u>1 PL Ground</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

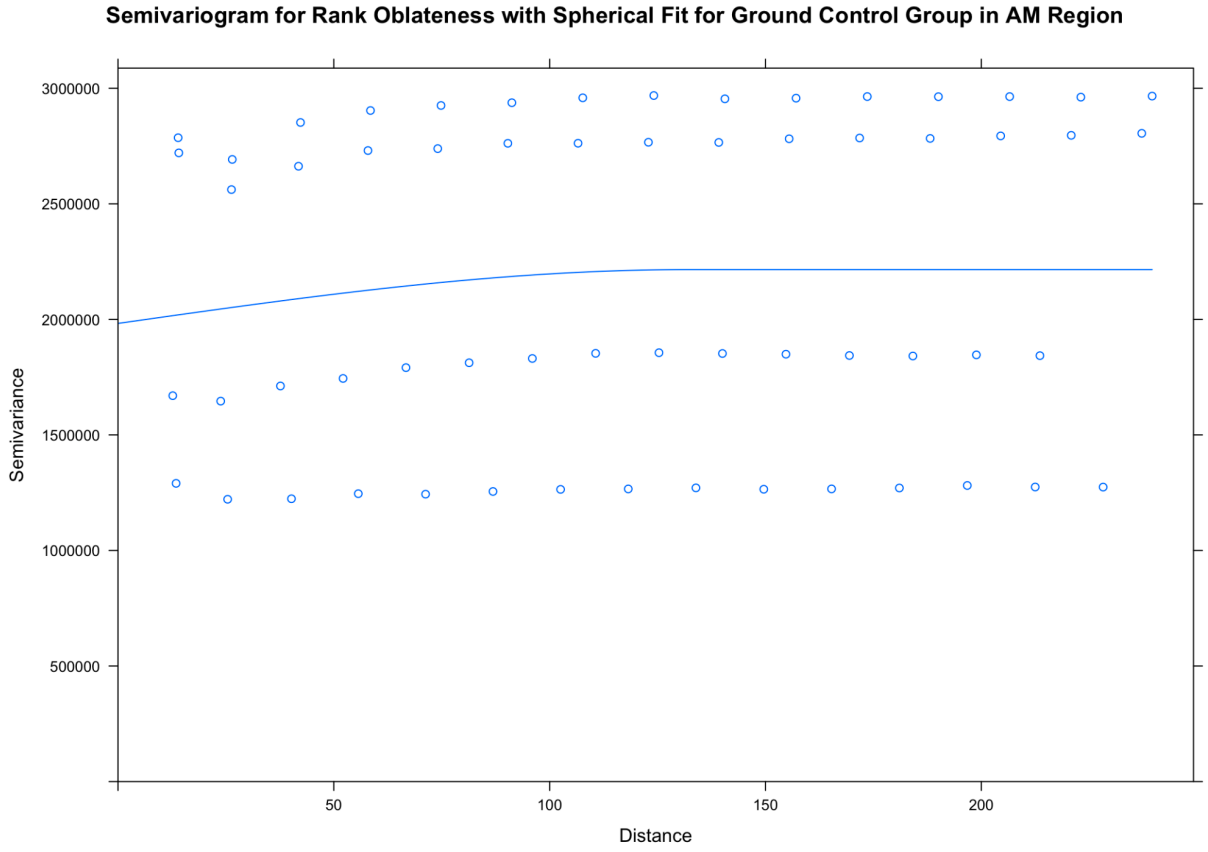
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

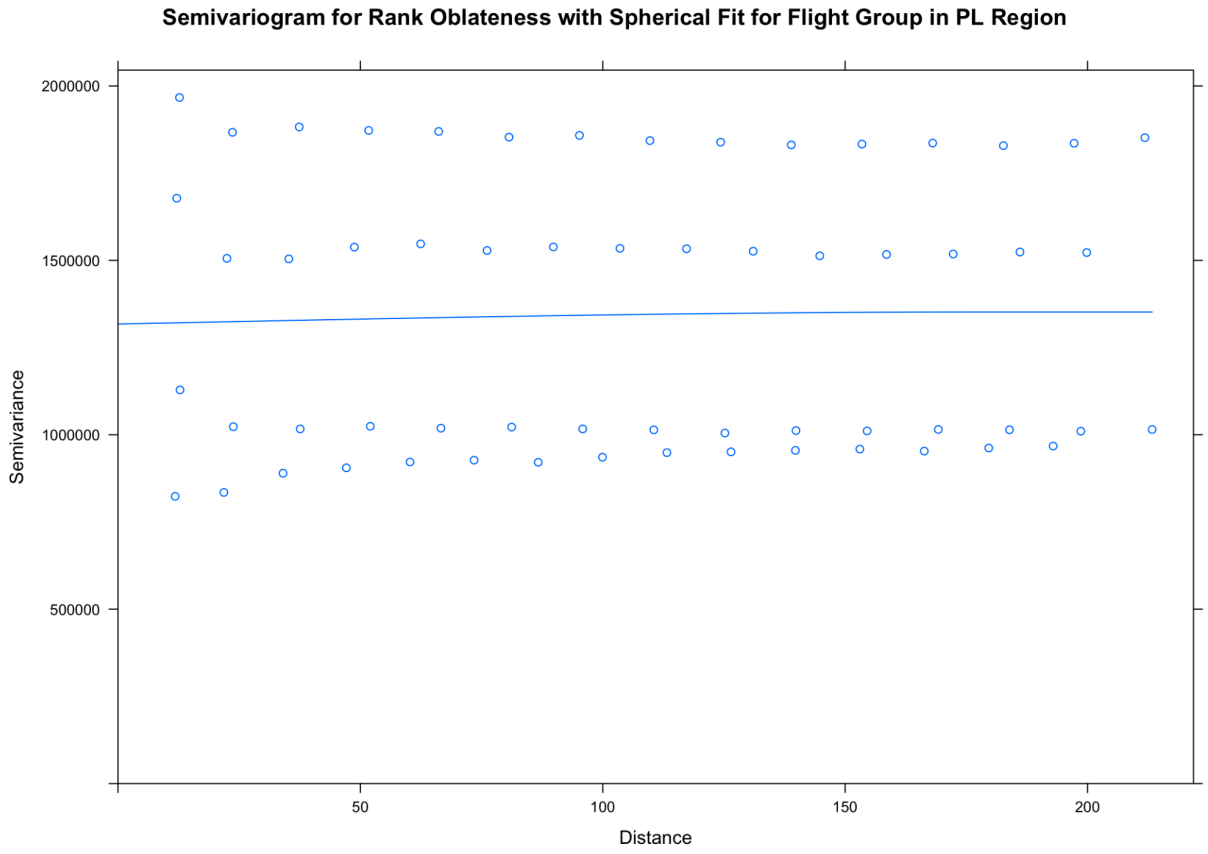
Analyses performed and report written by Sandra Tredinnick



<u>3 PL Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

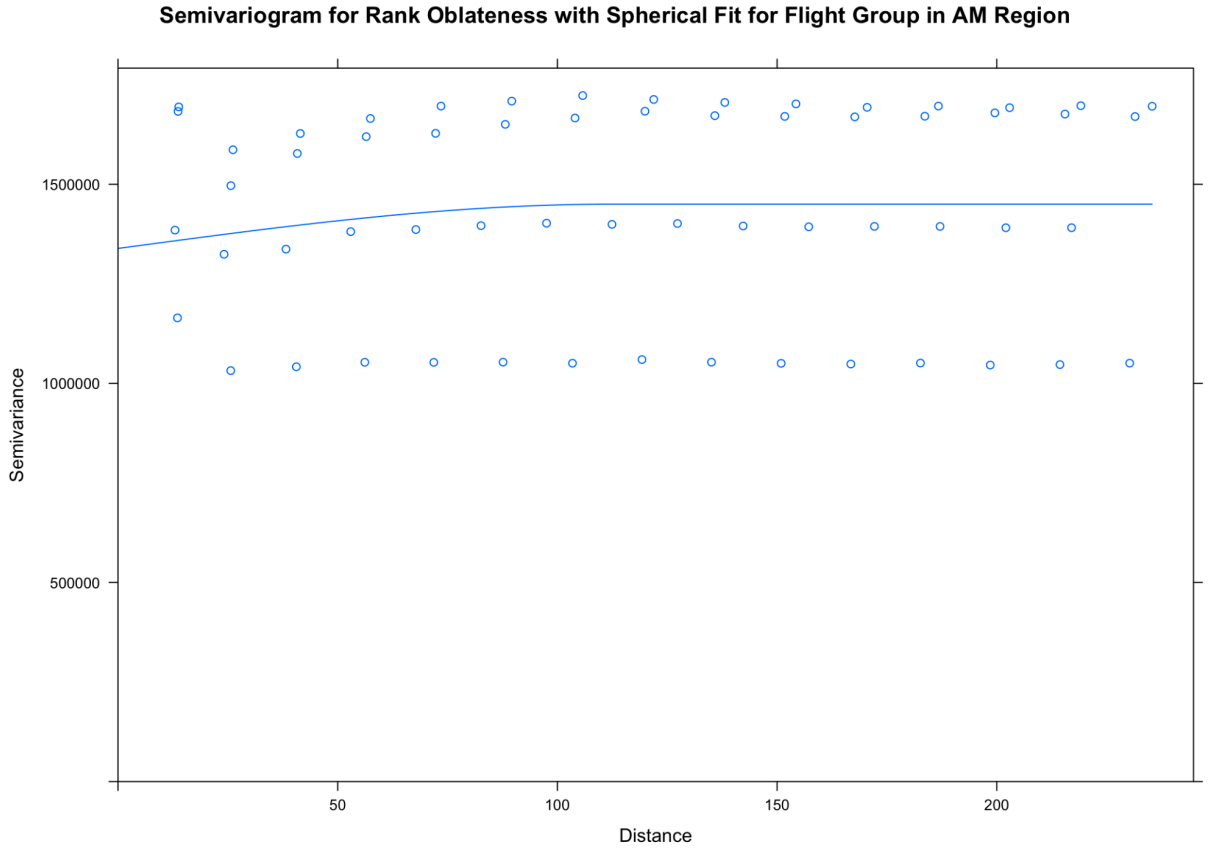
Analyses performed and report written by Sandra Tredinnick



4 AM Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

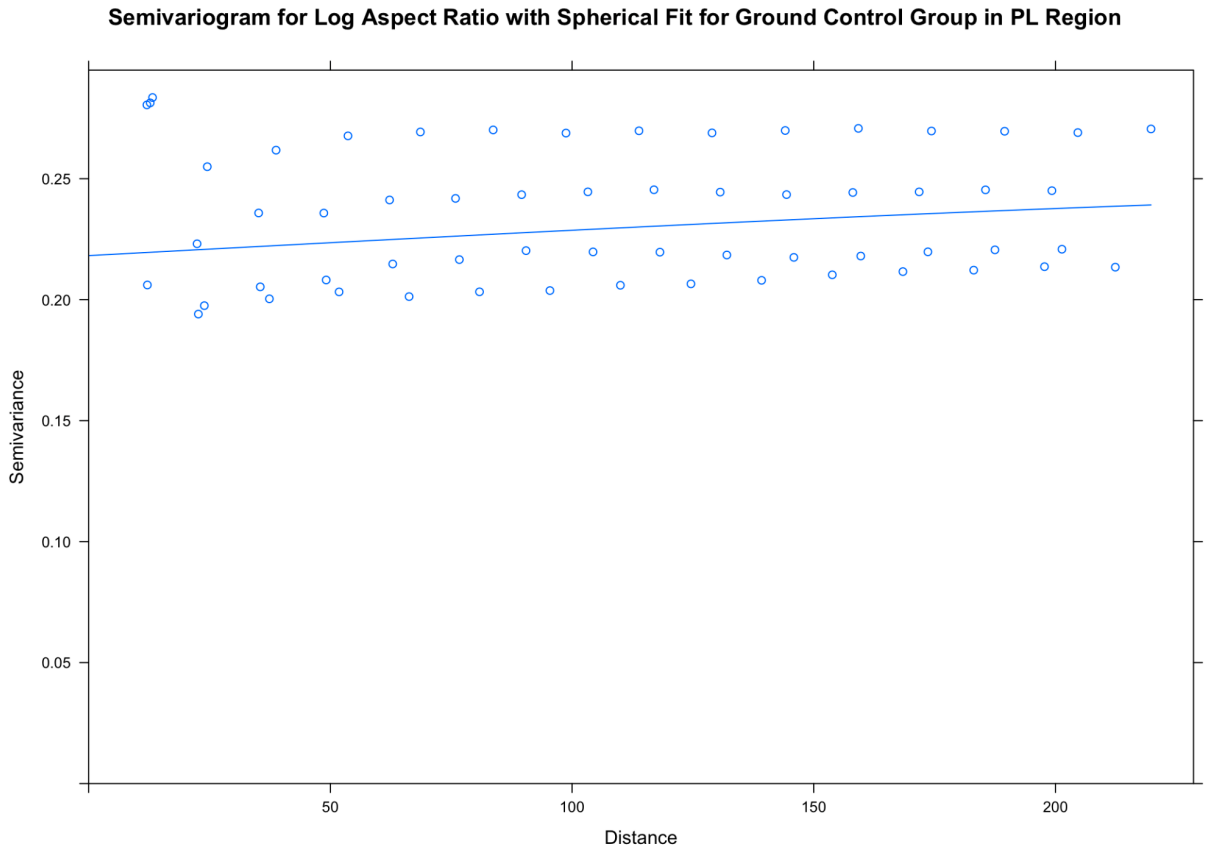


LOG ASPECT RATIO

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

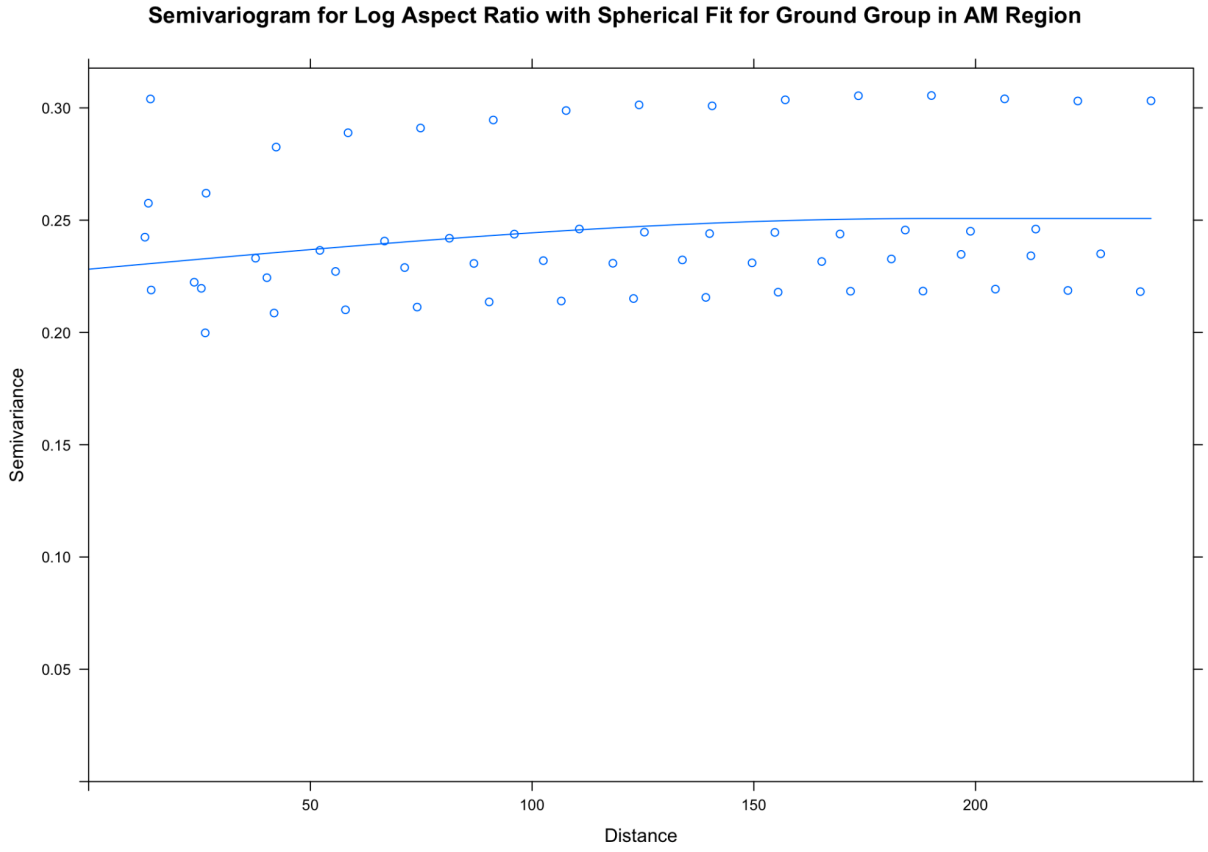
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

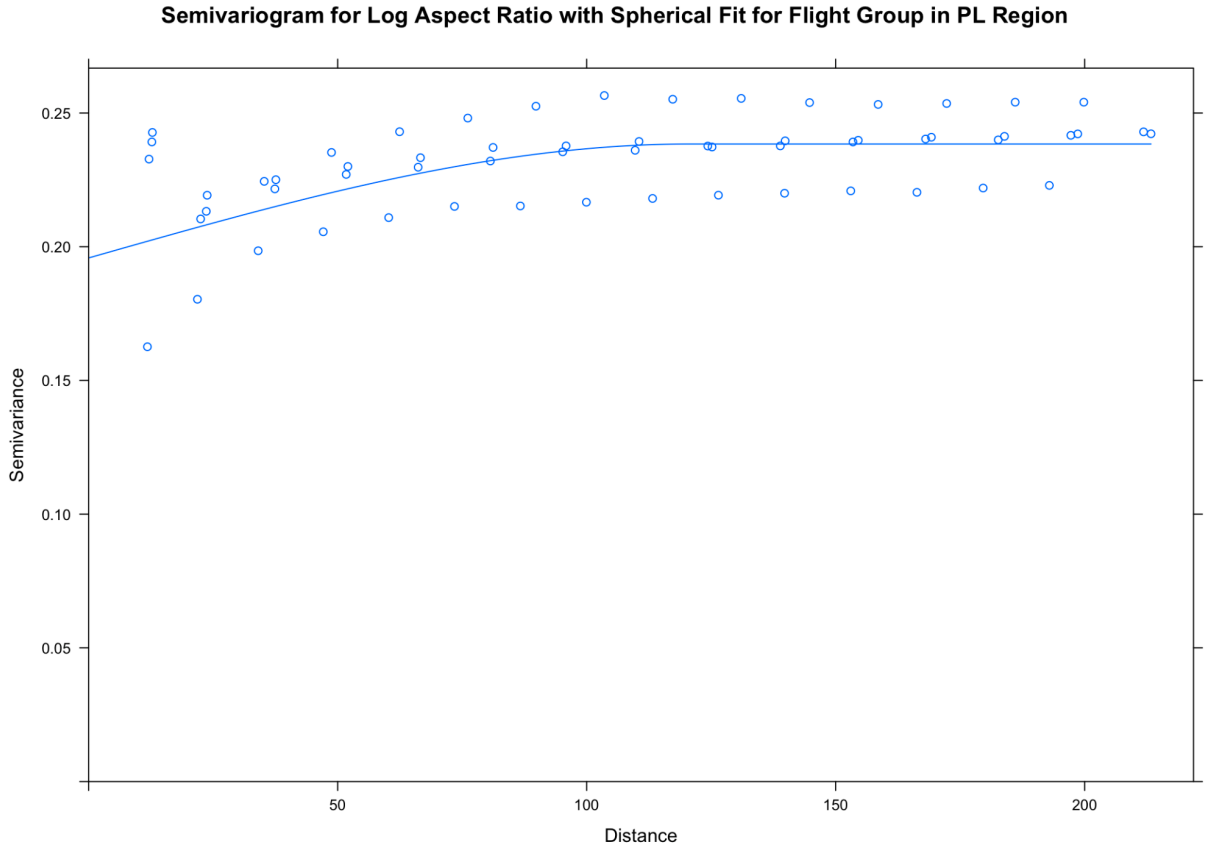
Analyses performed and report written by Sandra Tredinnick



<u>3 PL Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

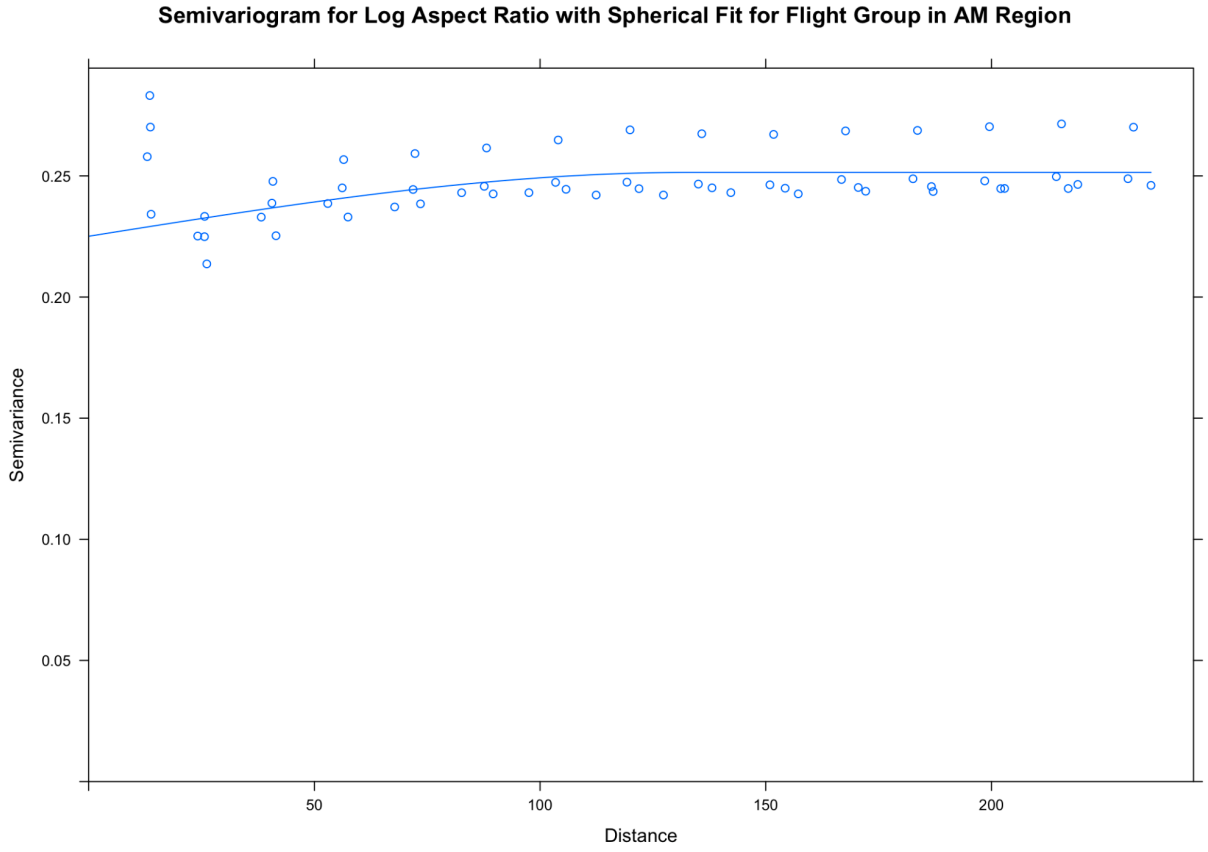
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

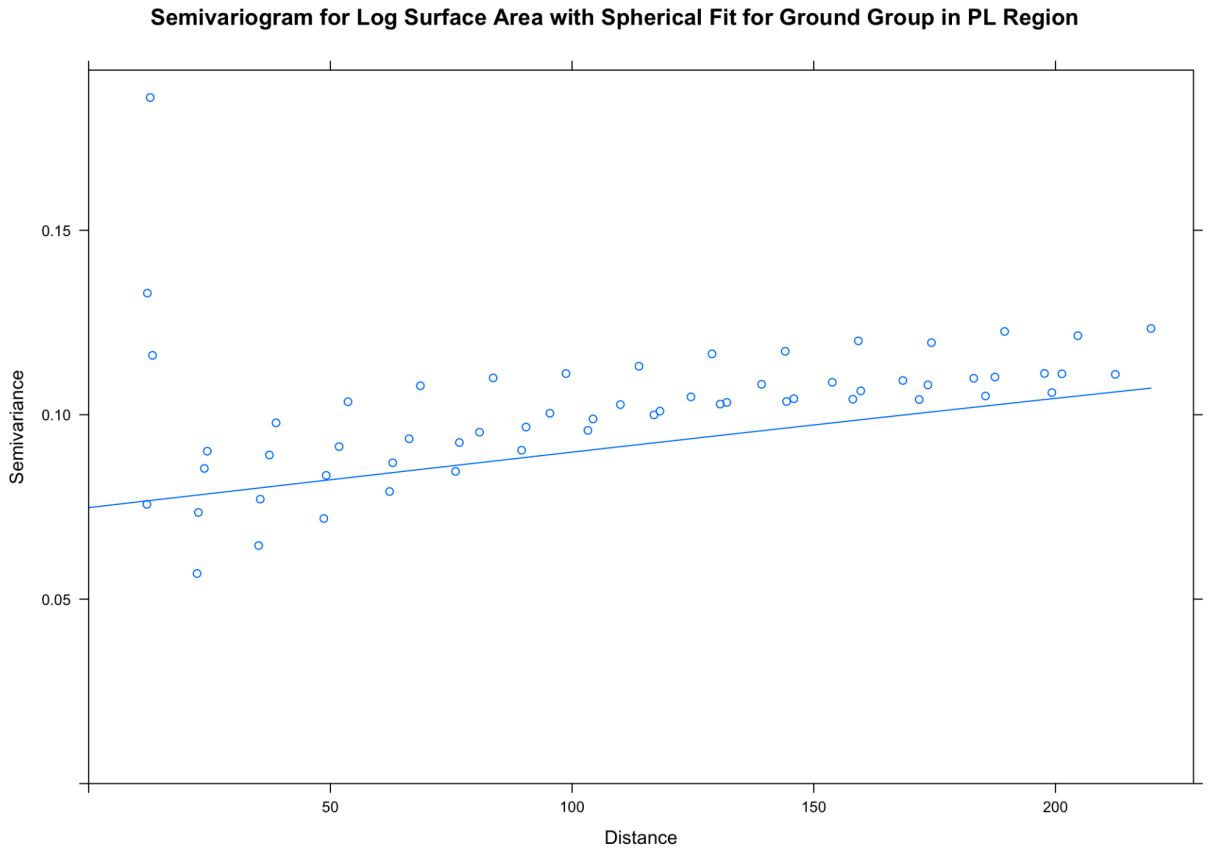


LOG SURFACE AREA

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

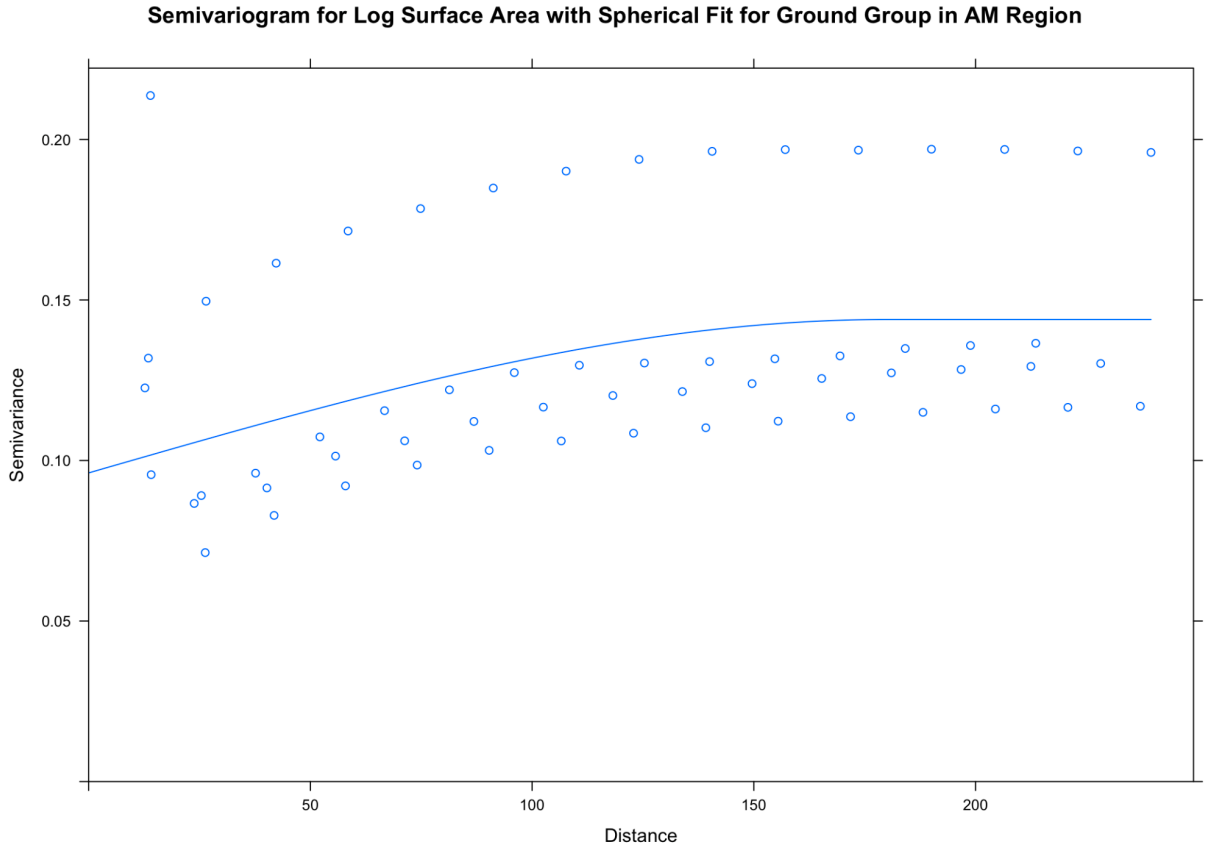
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

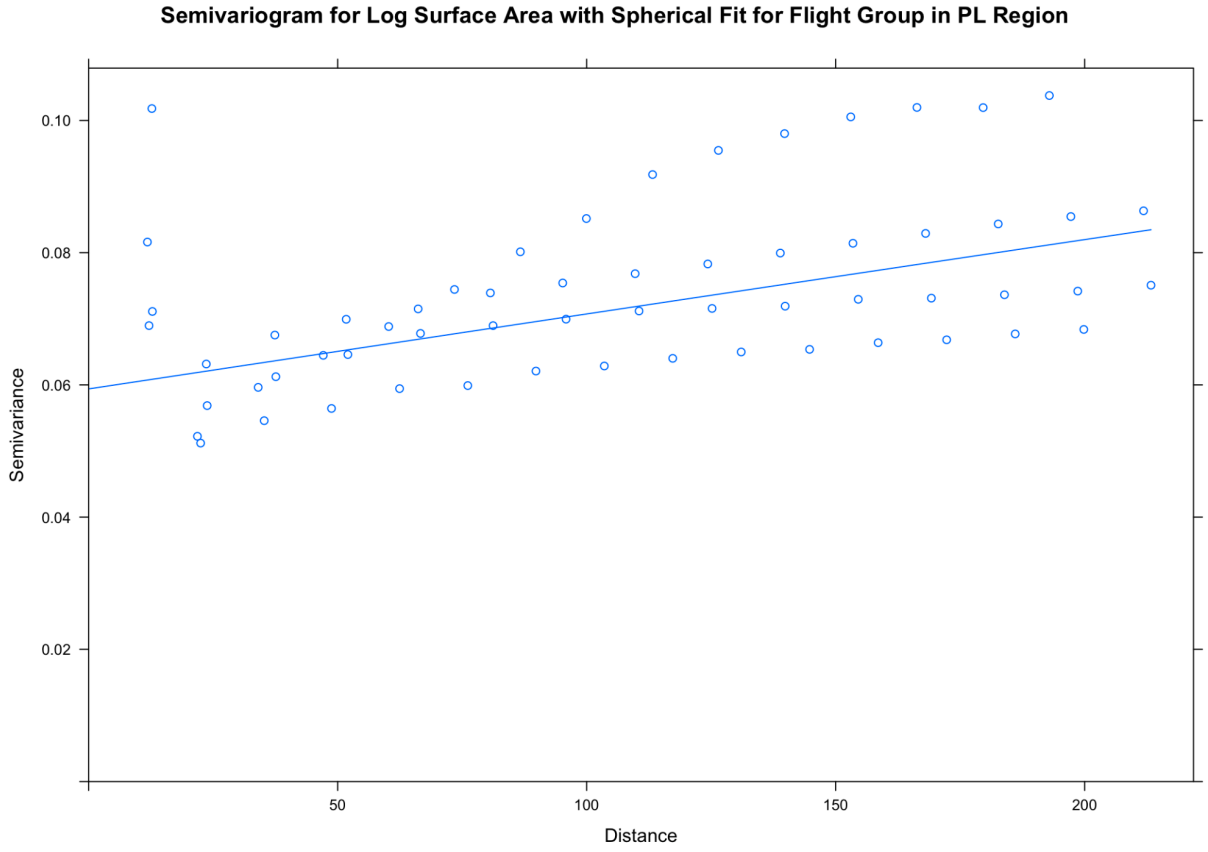
Analyses performed and report written by Sandra Tredinnick



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

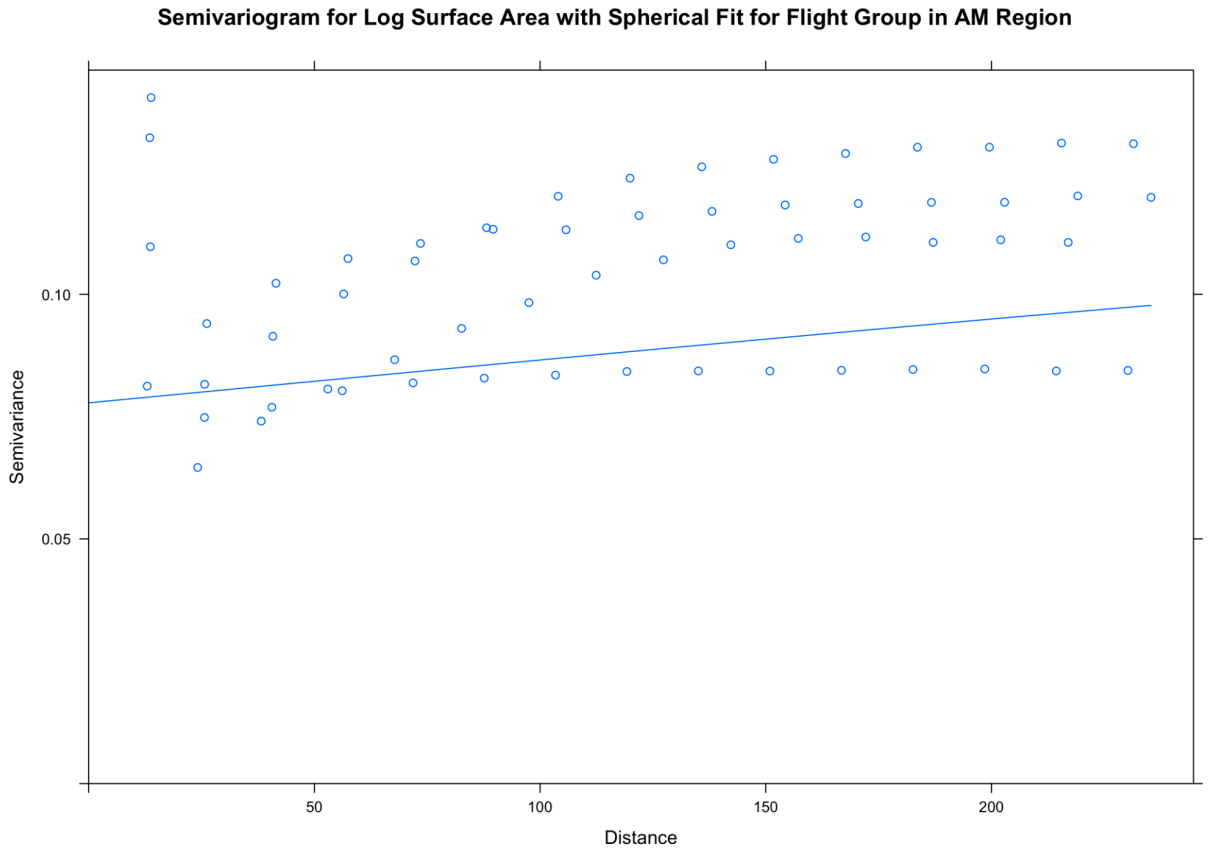
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

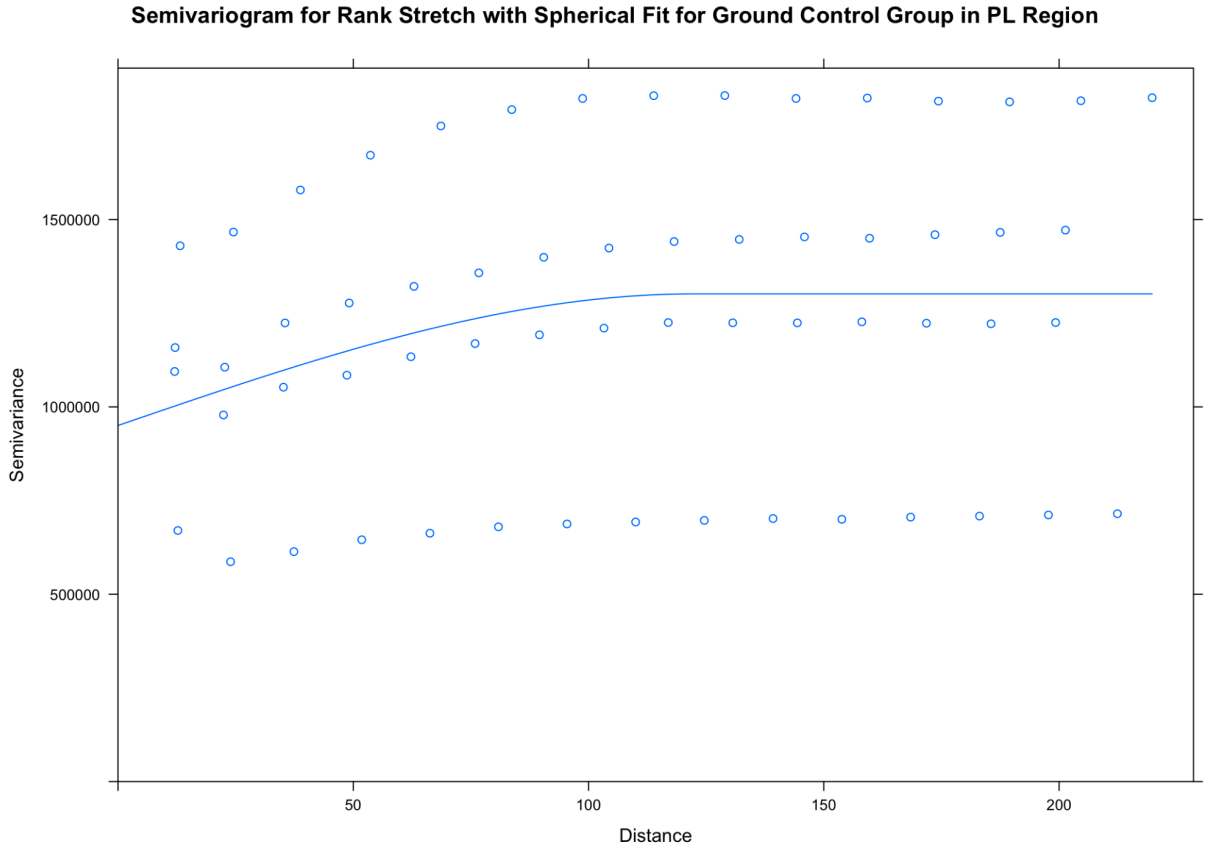


<u>RANK STRETCH</u>

<u>1 PL Ground</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

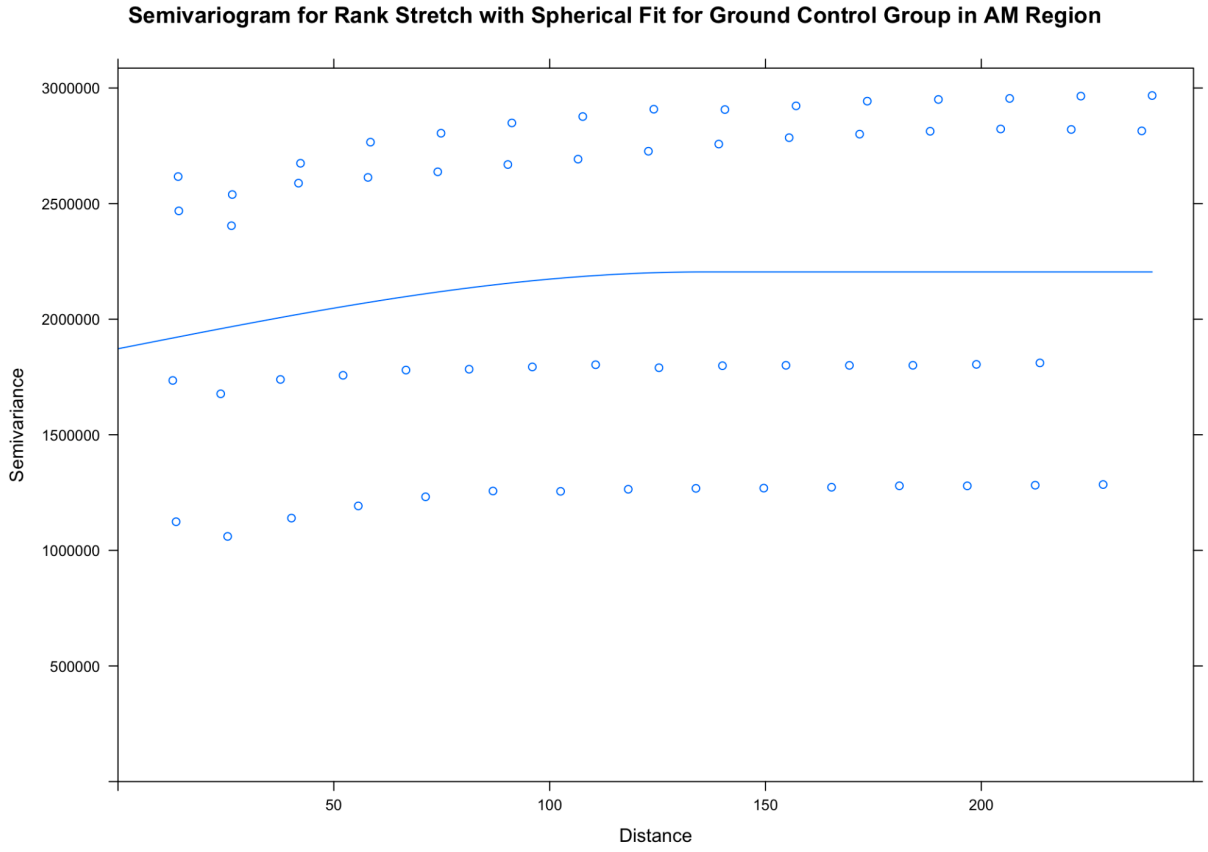
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

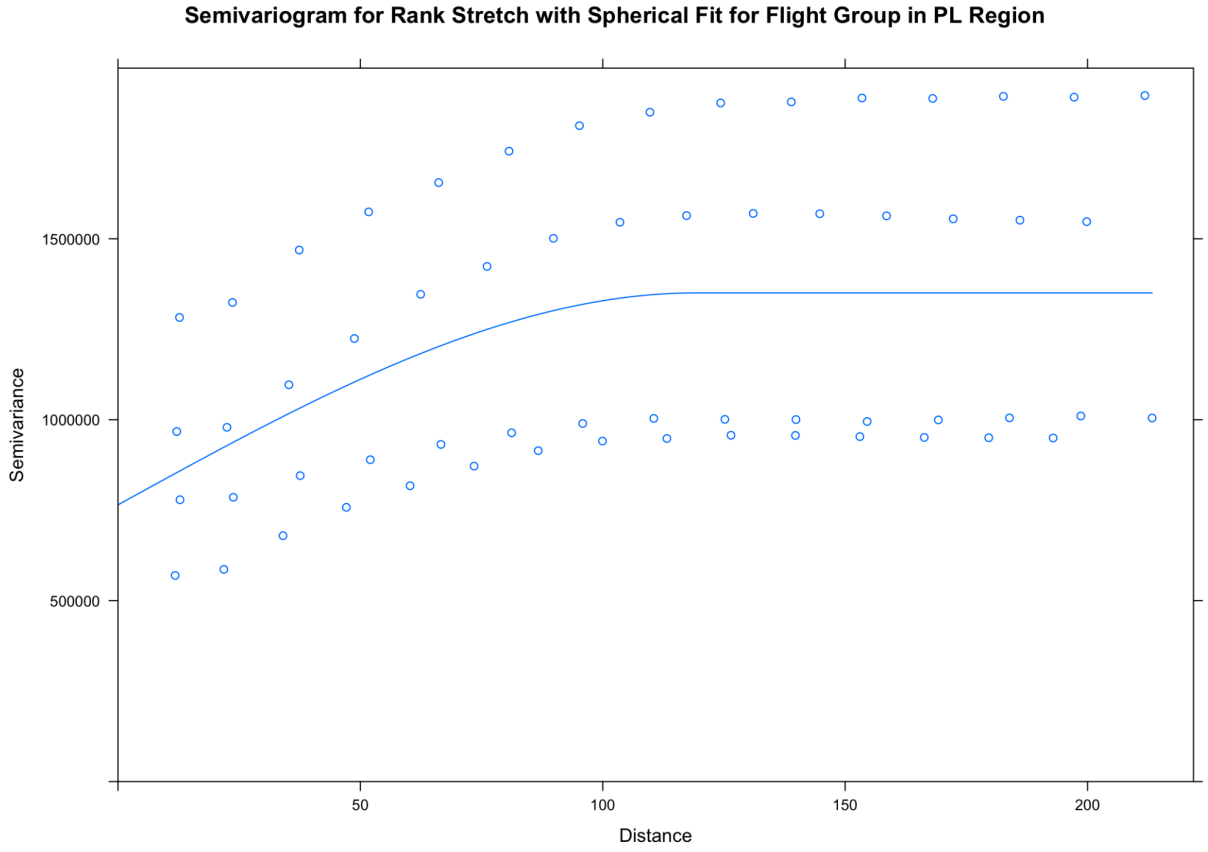
Analyses performed and report written by Sandra Tredinnick



<u>3 PL Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

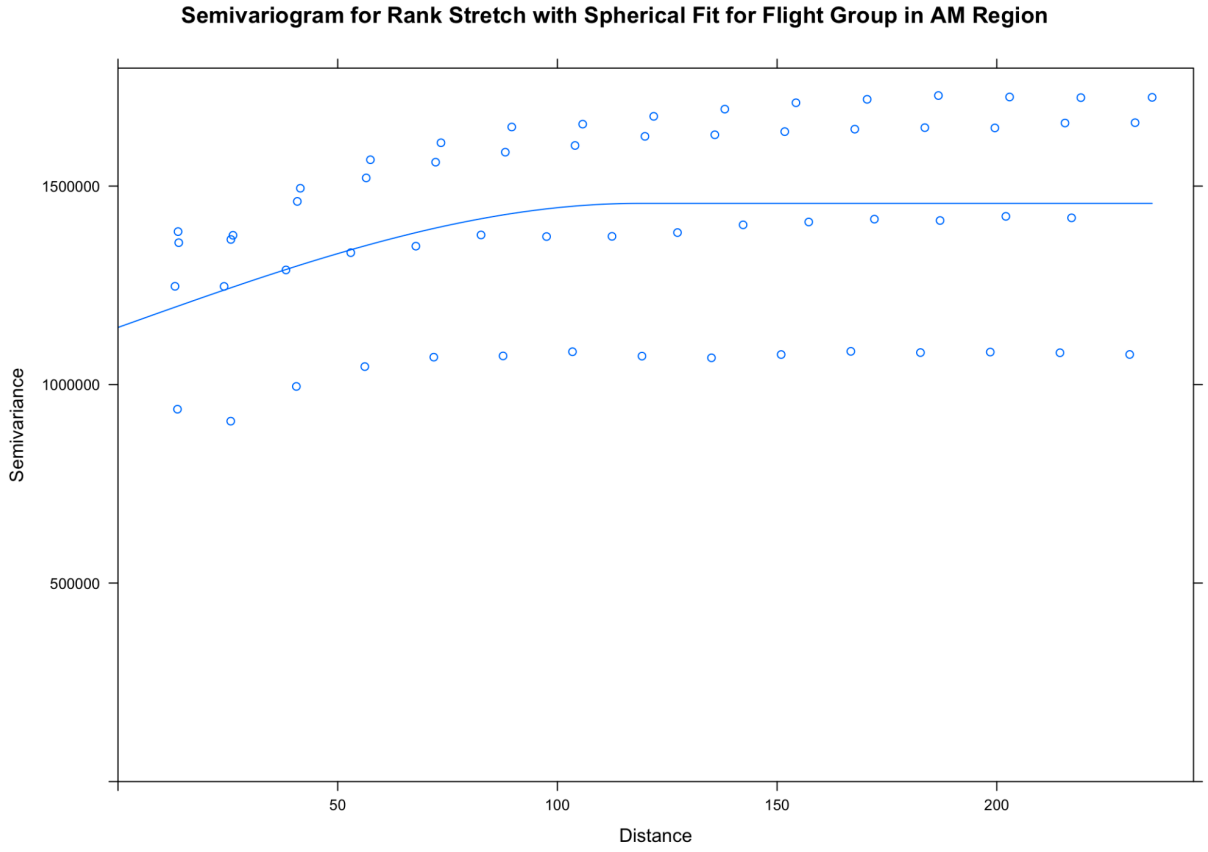
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

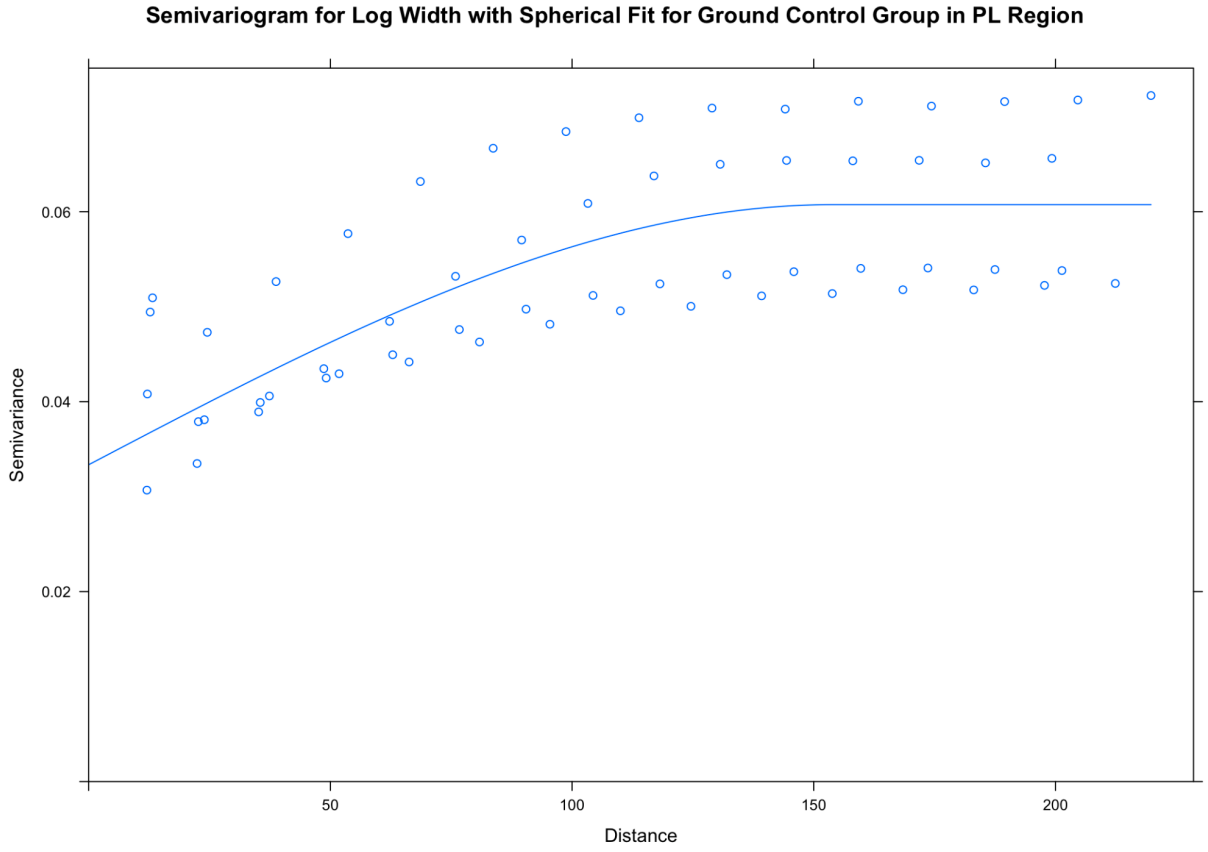


LOG WIDTH

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

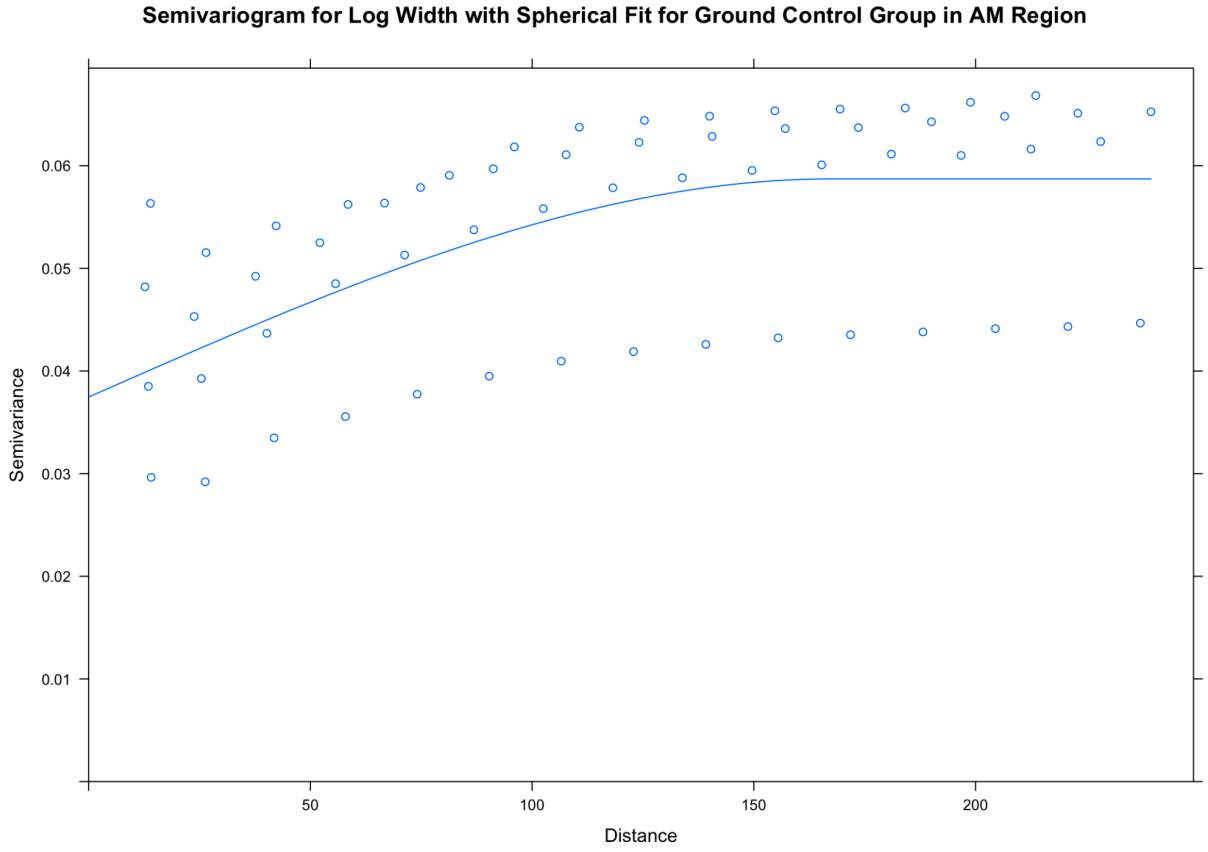
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

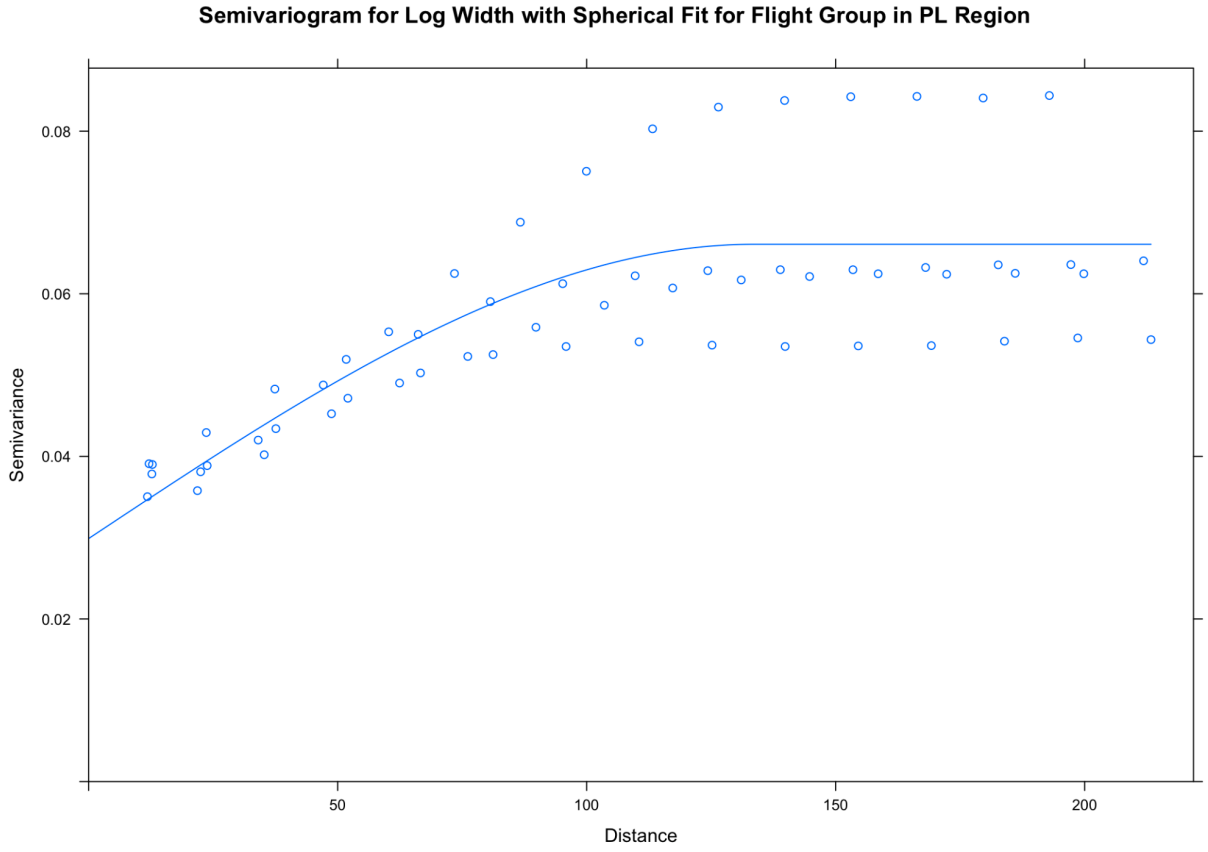
Analyses performed and report written by Sandra Tredinnick



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

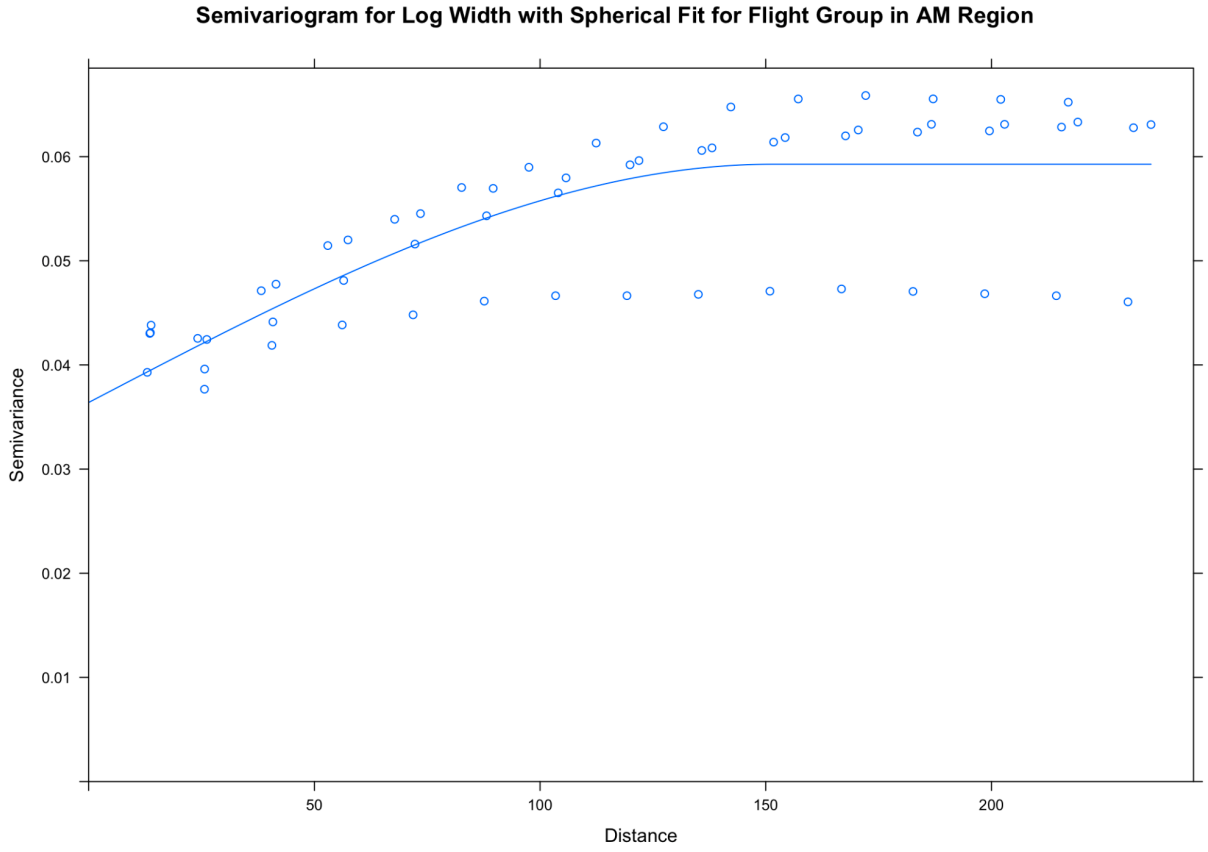
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

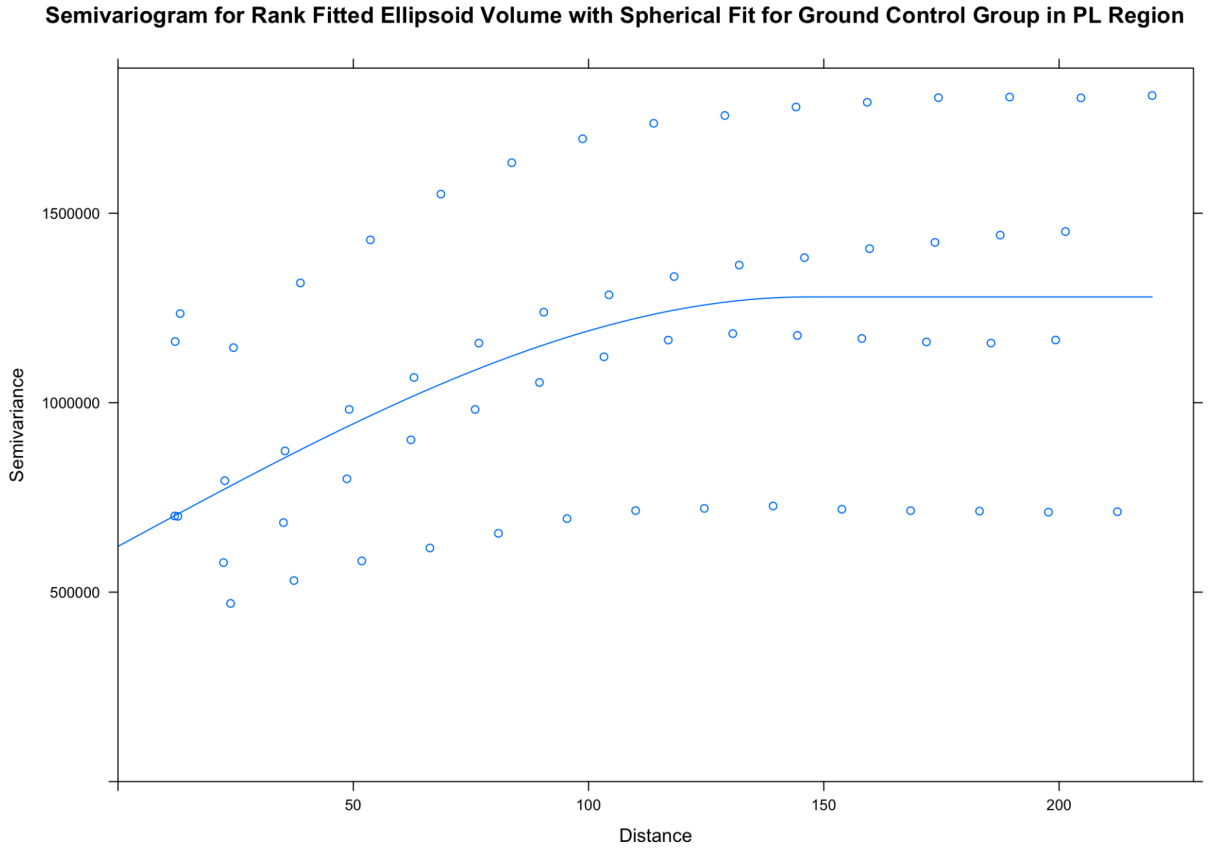


<u>RANK FITTED ELLIPSOID VOLUME</u>

<u>1 PL Ground</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

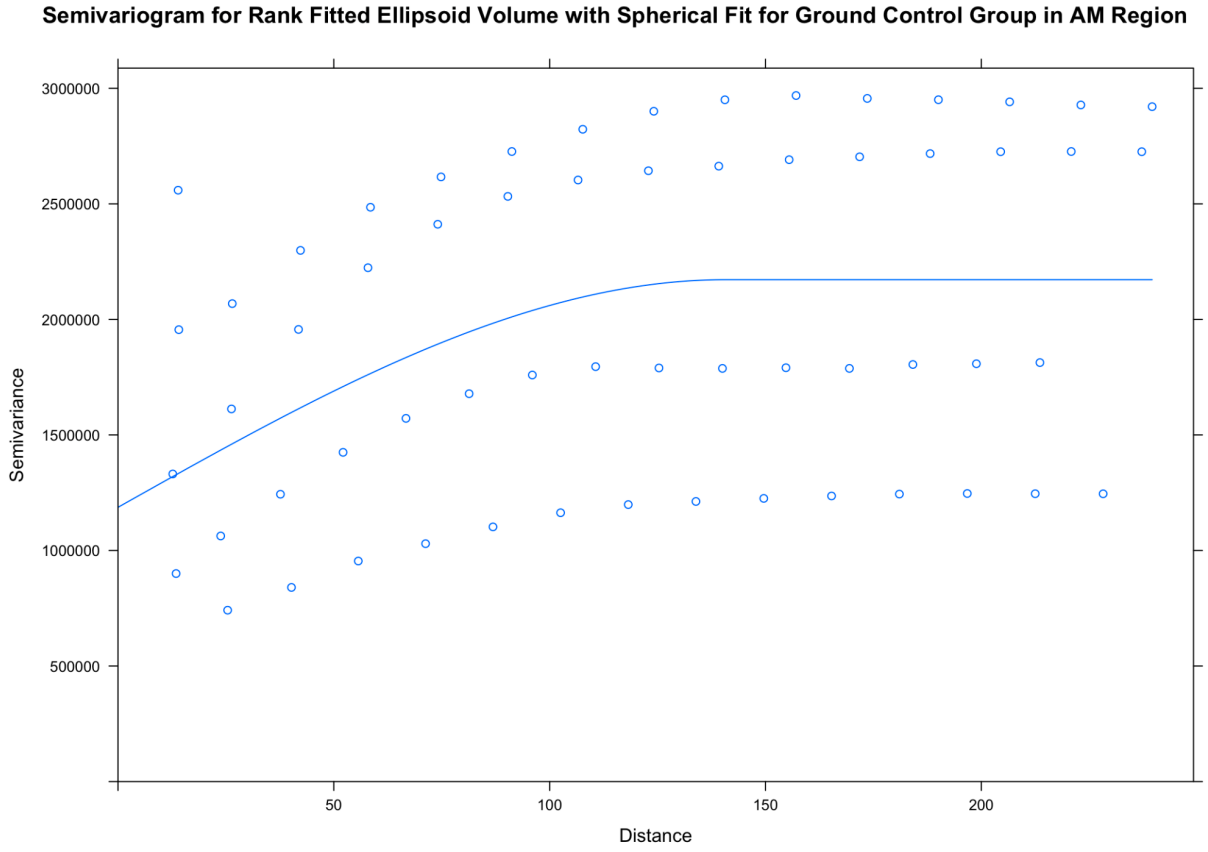
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

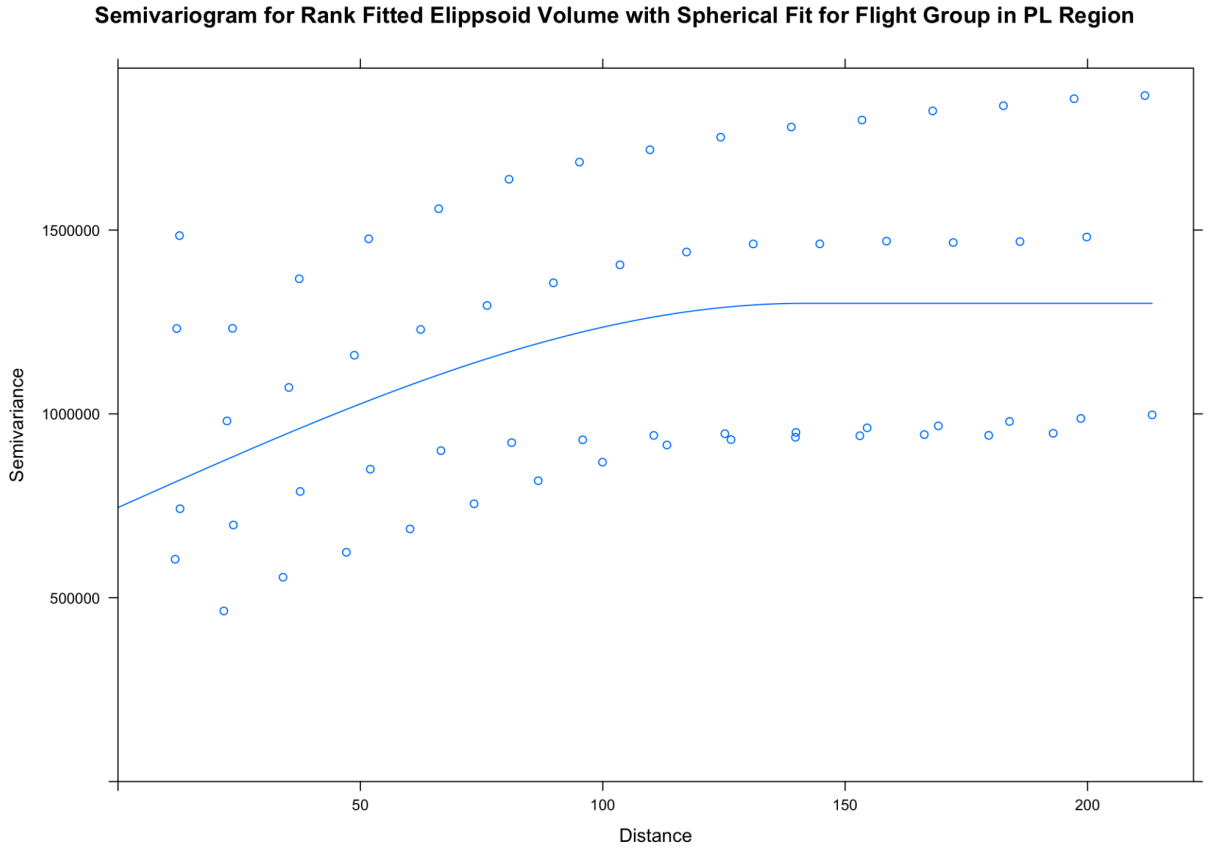
Analyses performed and report written by Sandra Tredinnick



<u>3 PL Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

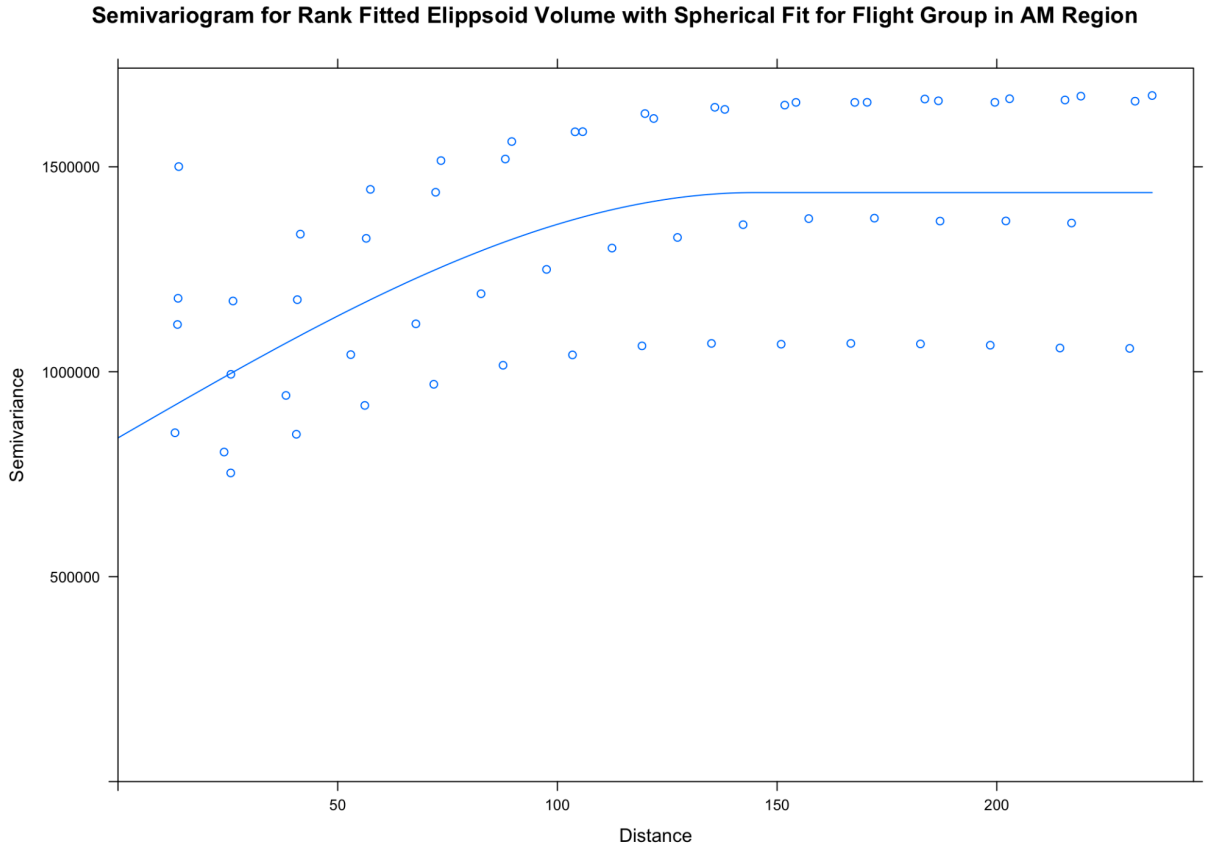
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

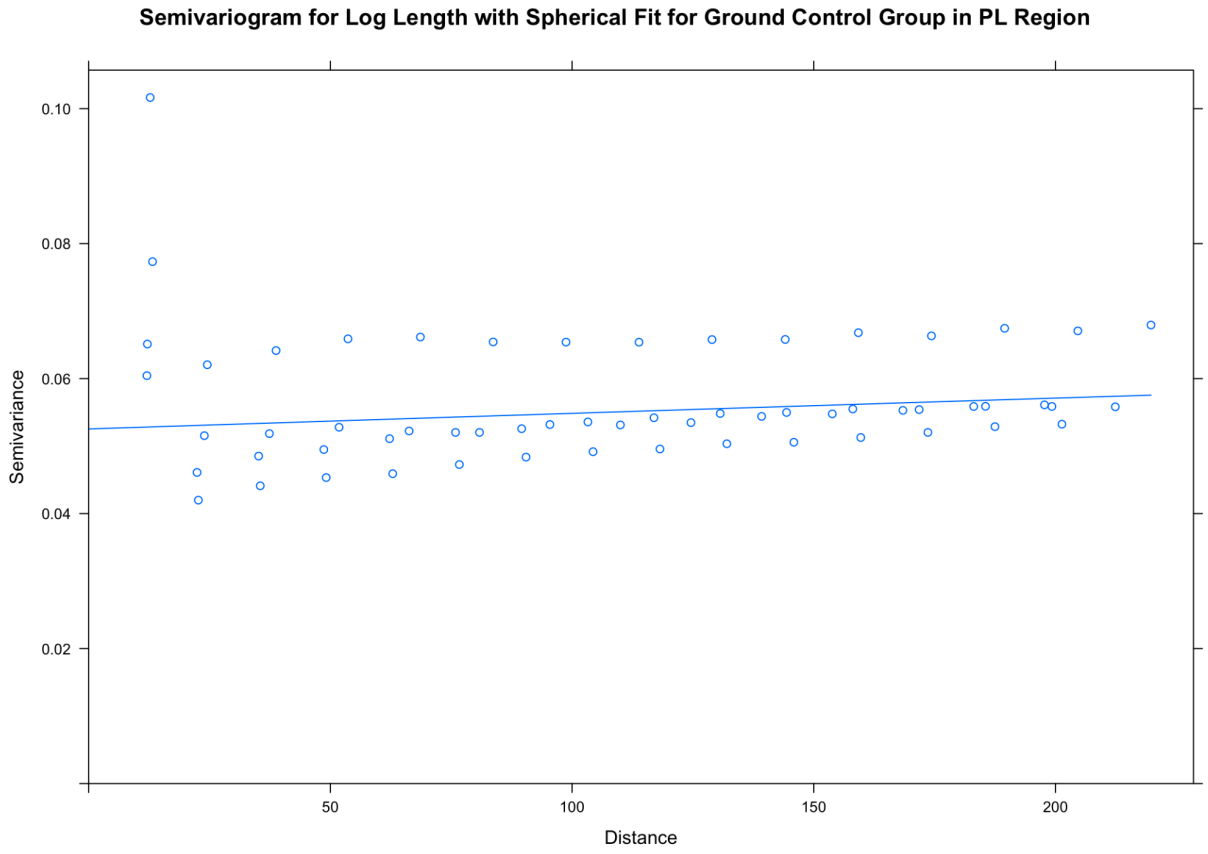


<u>LOG LENGTH</u>

<u>1 PL Ground</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

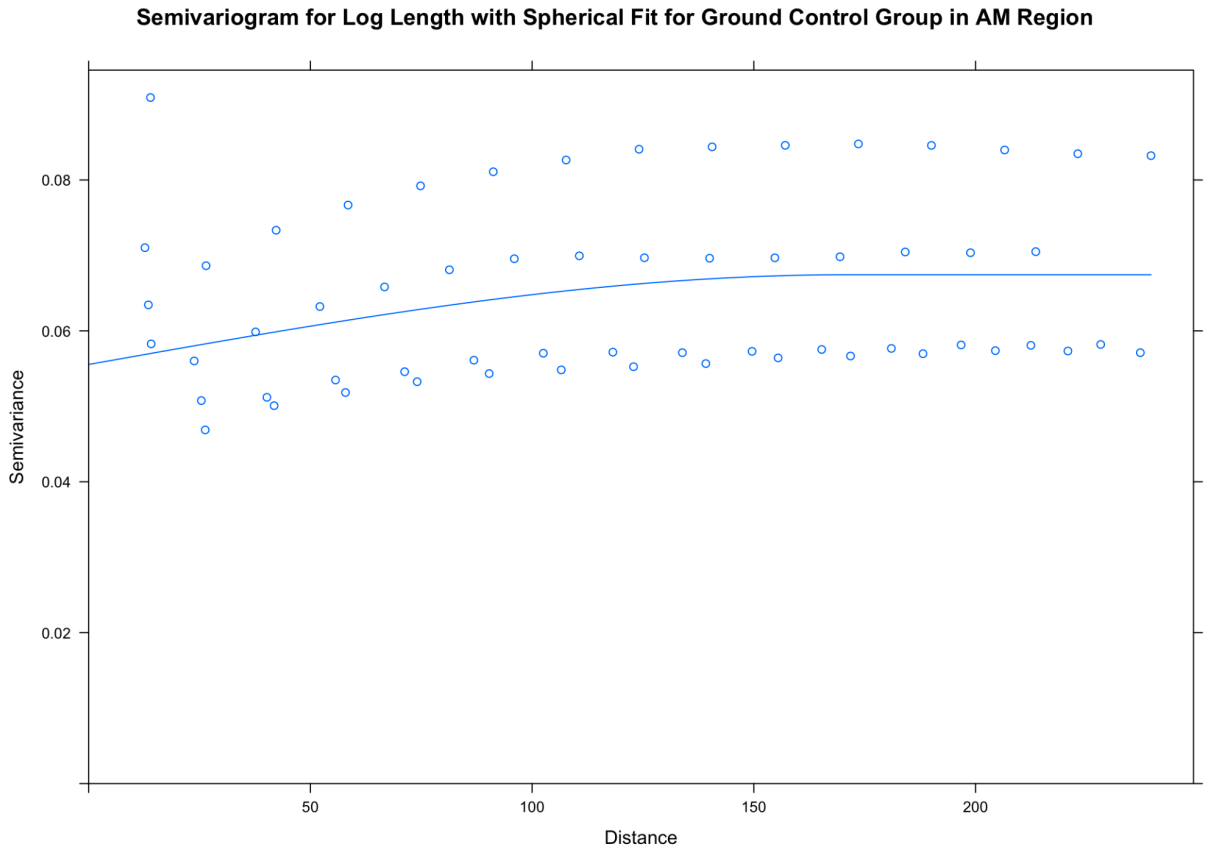
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

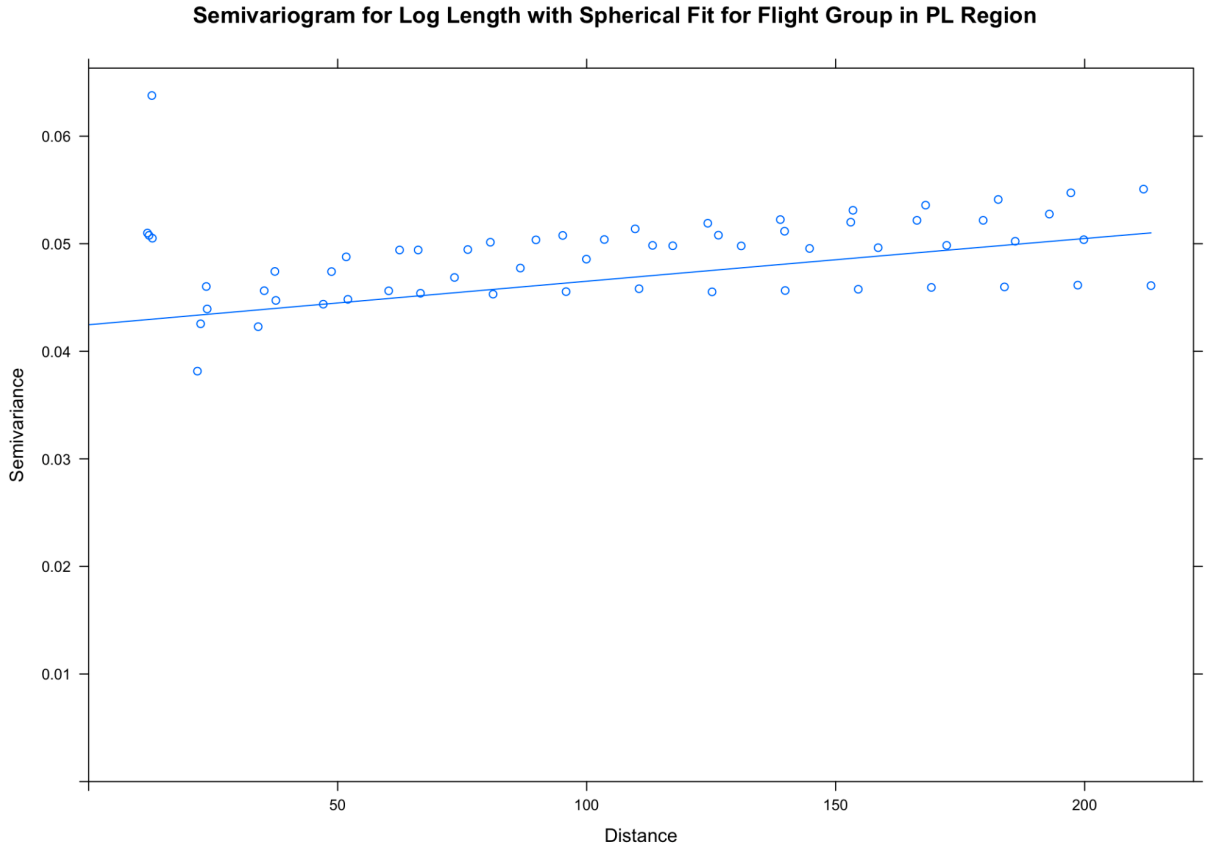
Analyses performed and report written by Sandra Tredinnick



<u>3 PL Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

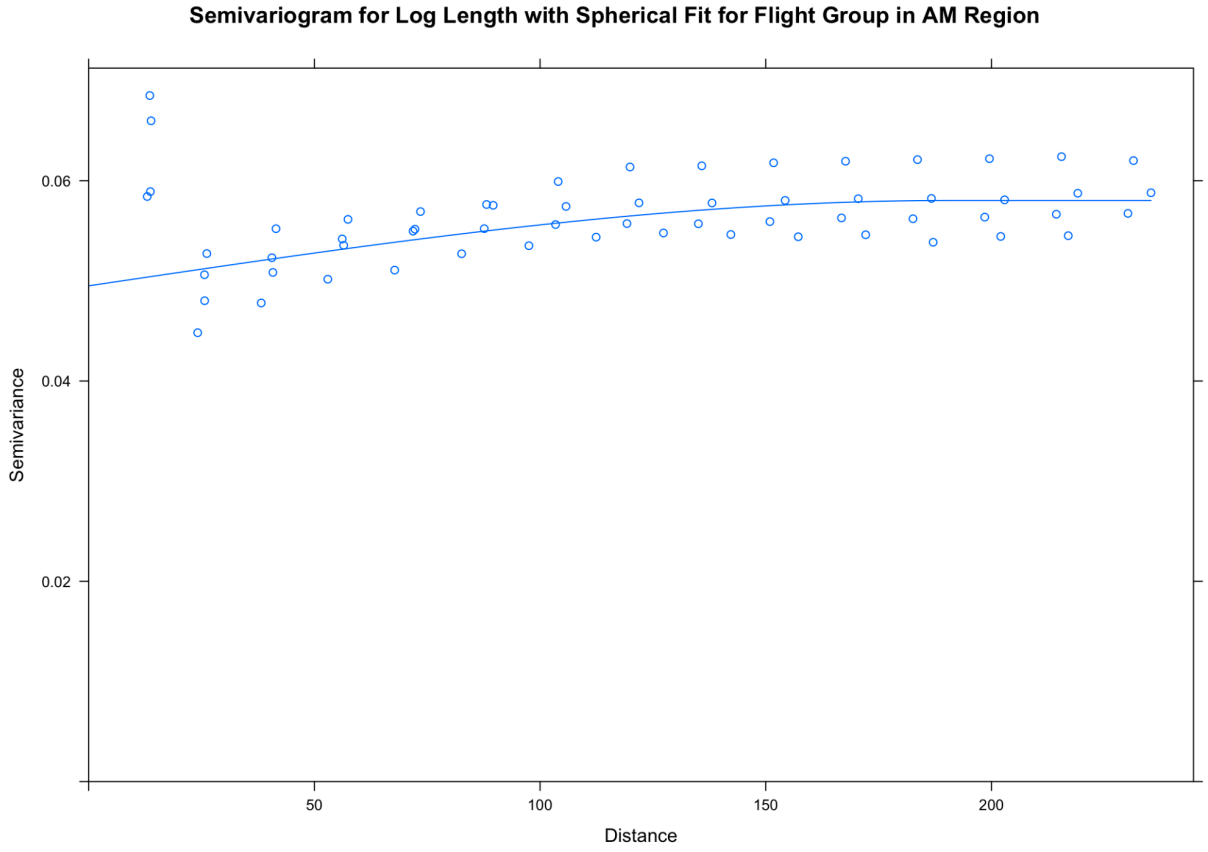
Analyses performed and report written by Sandra Tredinnick



4 AM Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

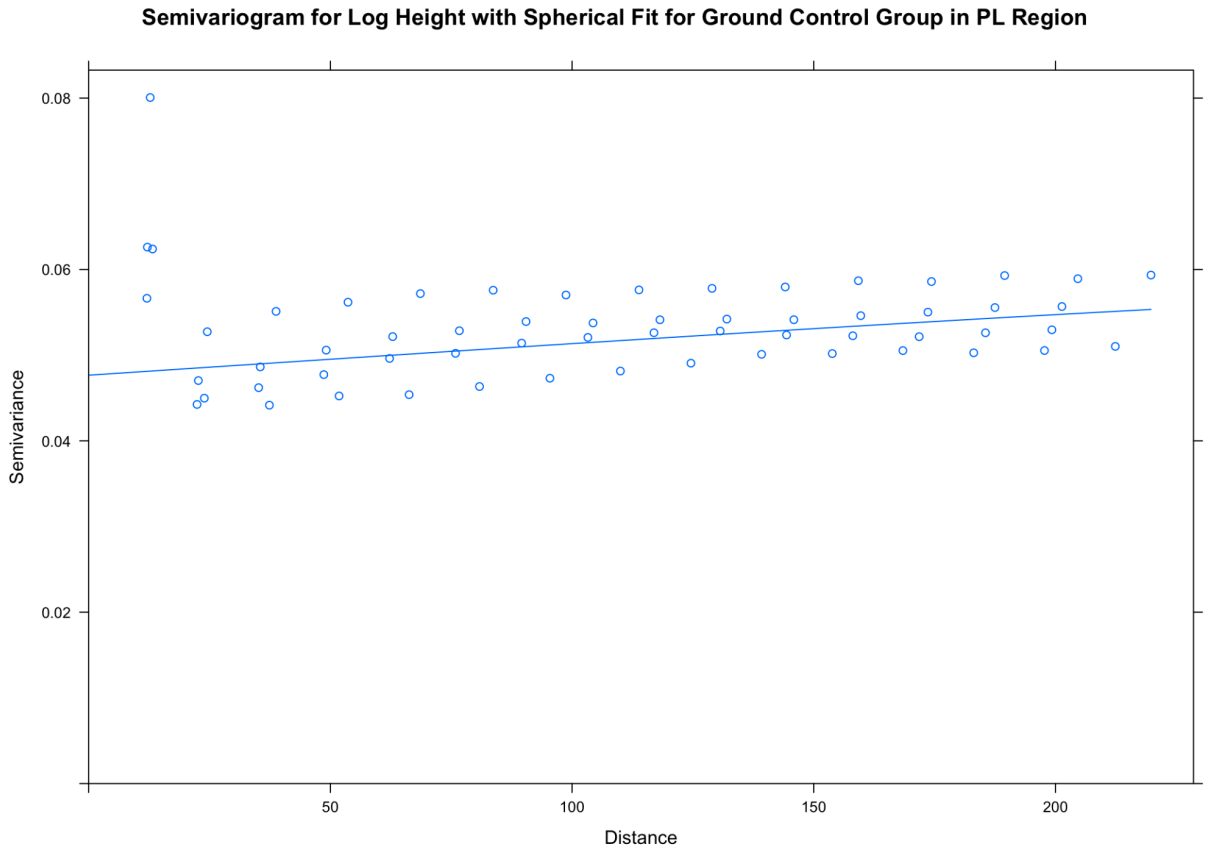


LOG HEIGHT

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

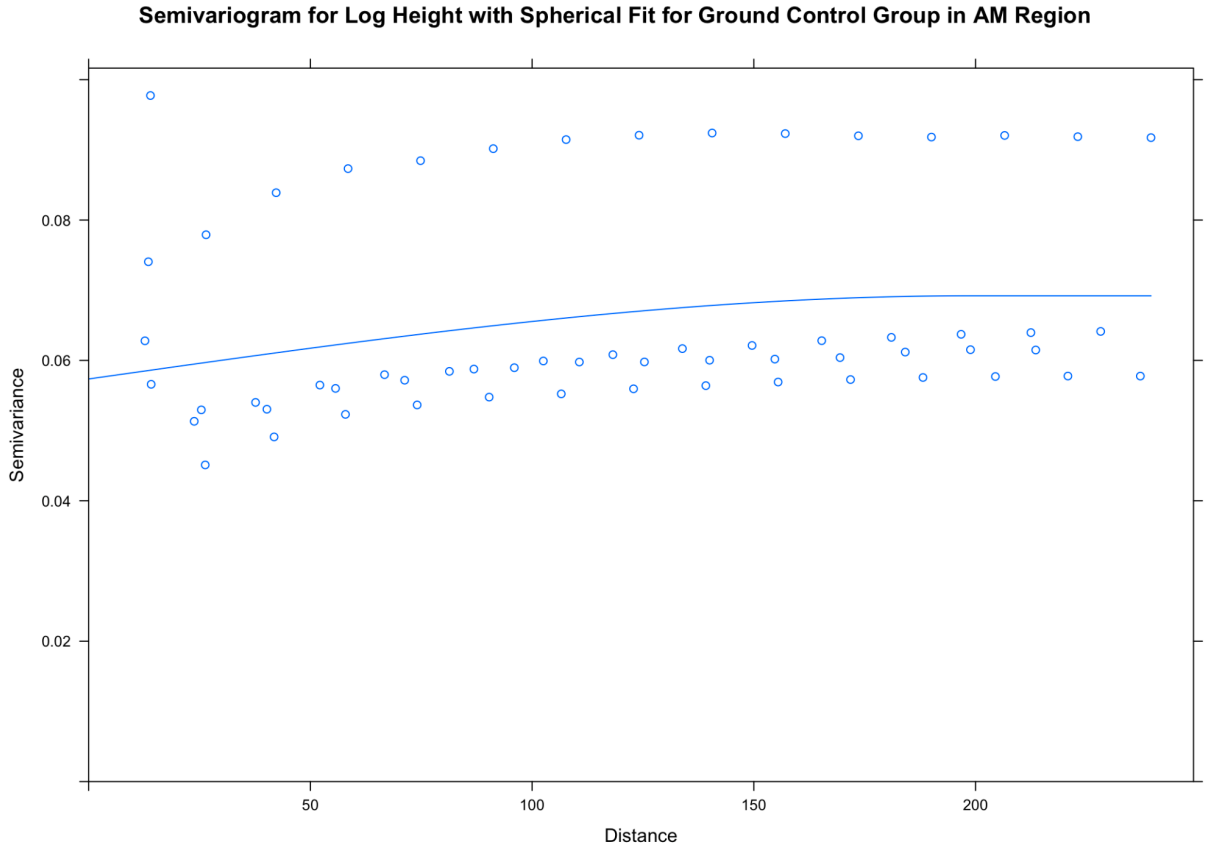
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

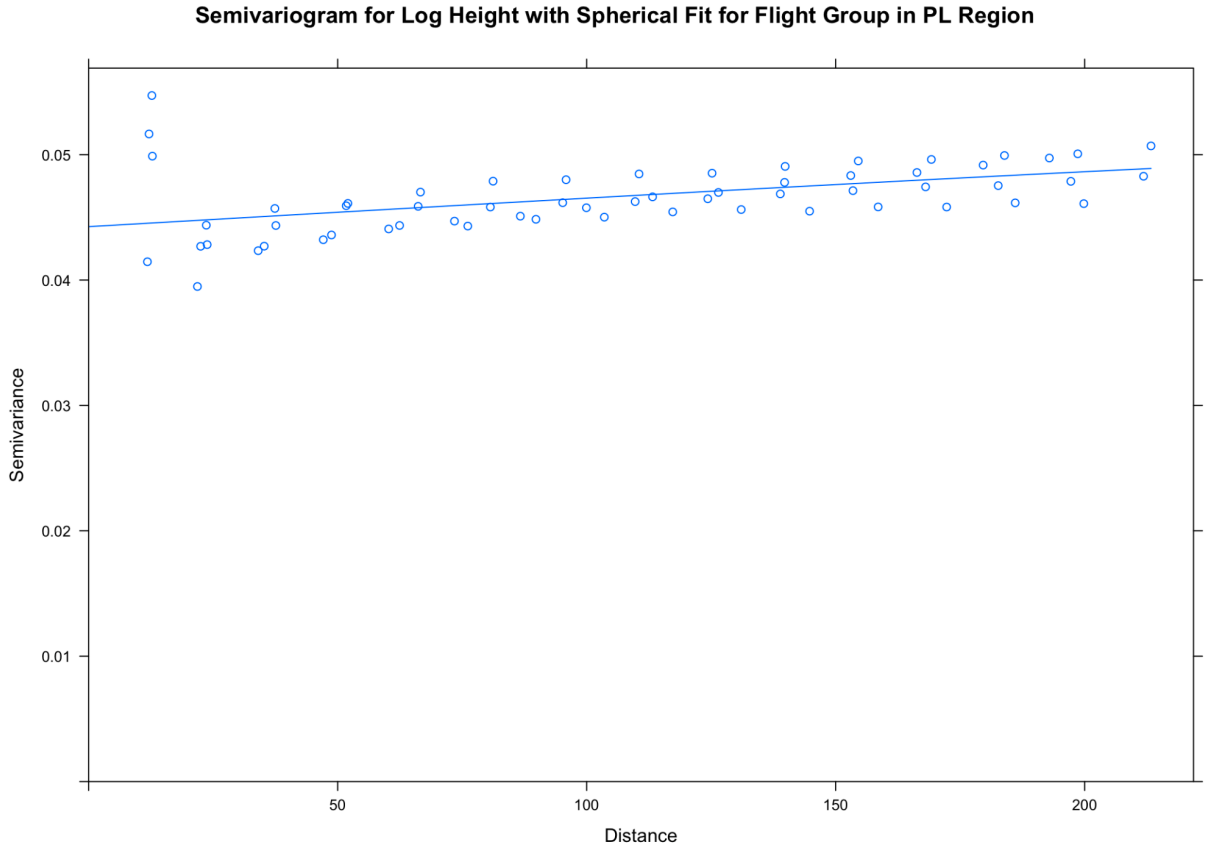
Analyses performed and report written by Sandra Tredinnick



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

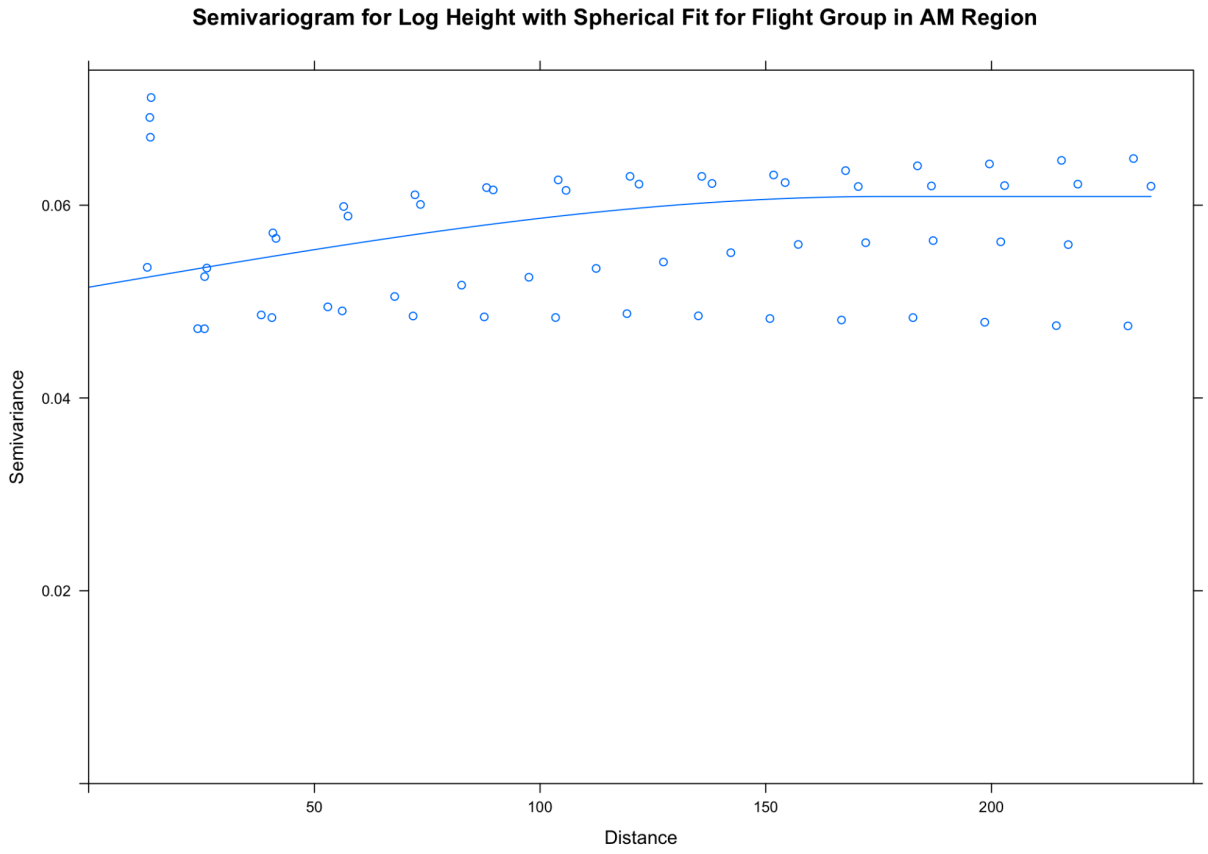
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick



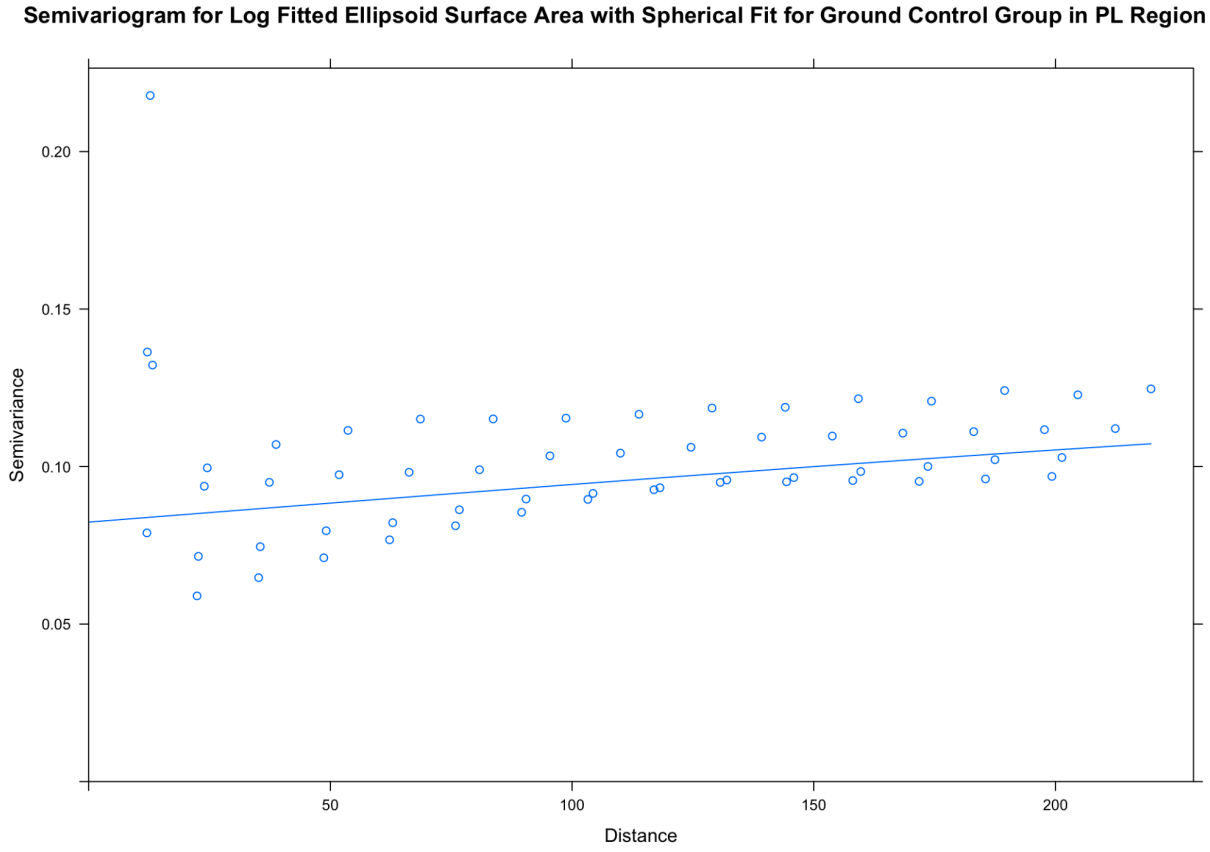
Note: a variogram curve could not be fit to mouse 222 for the log height lacunae metric (convergence issues). The curve shown in the plot above is produced by averaging the parameters from the variogram curves for mice 202, 208, and 215 only.

LOG FITTED ELLIPSOID SURFACE AREA

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

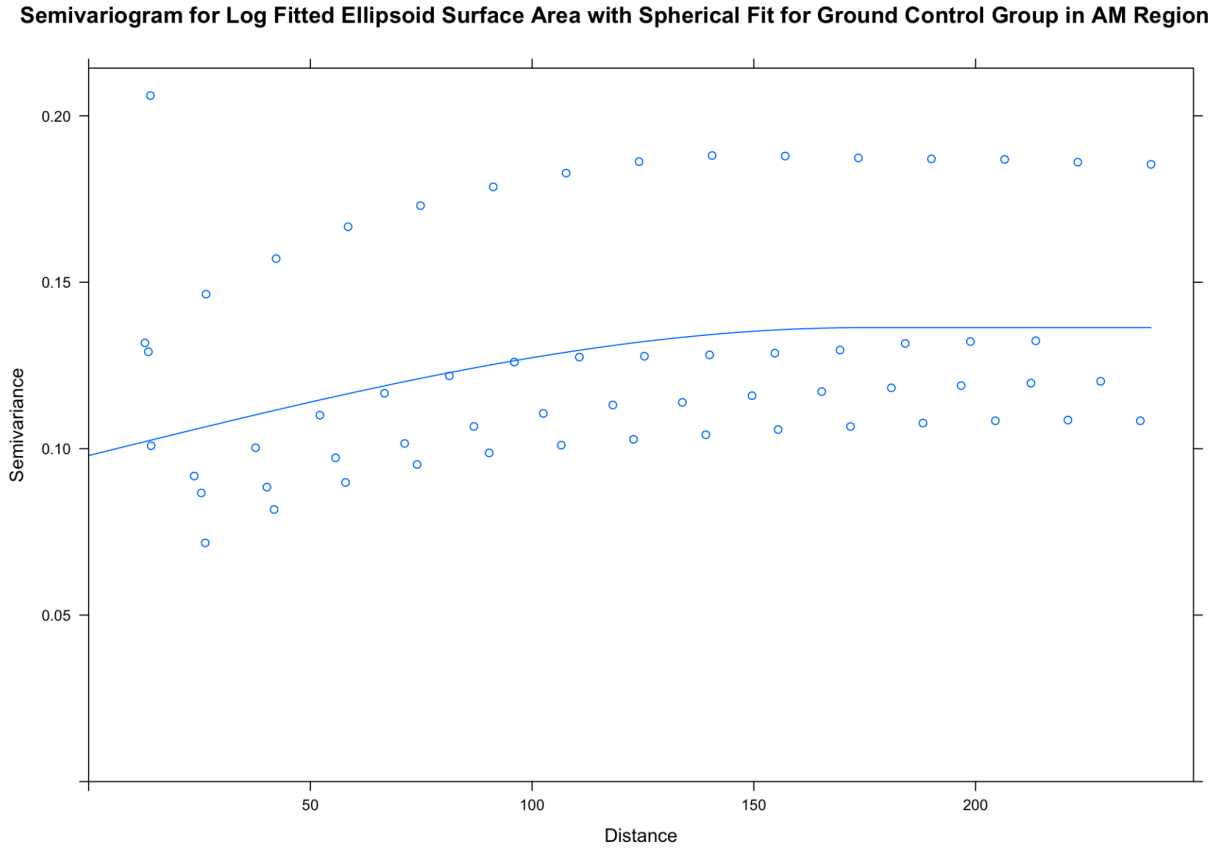
Analyses performed and report written by Sandra Tredinnick



2 AM Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

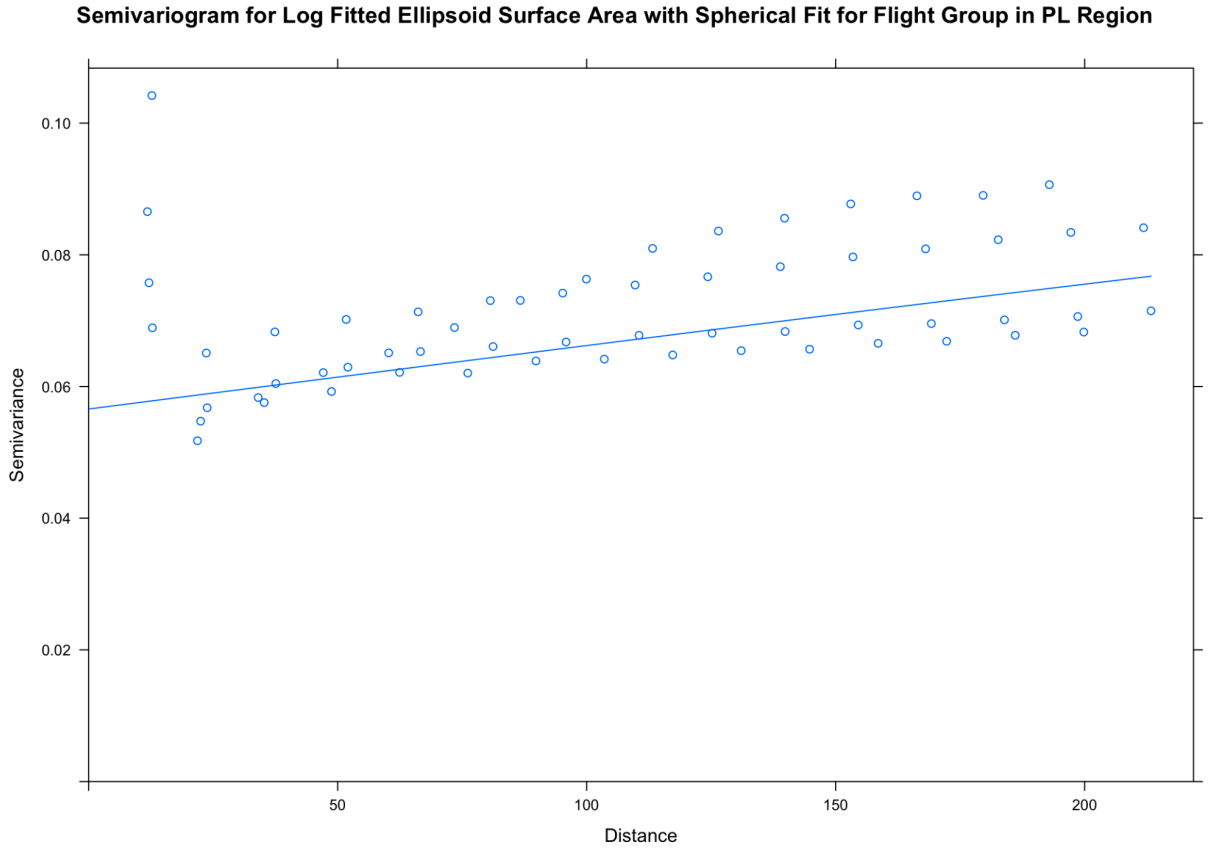
Analyses performed and report written by Sandra Tredinnick



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

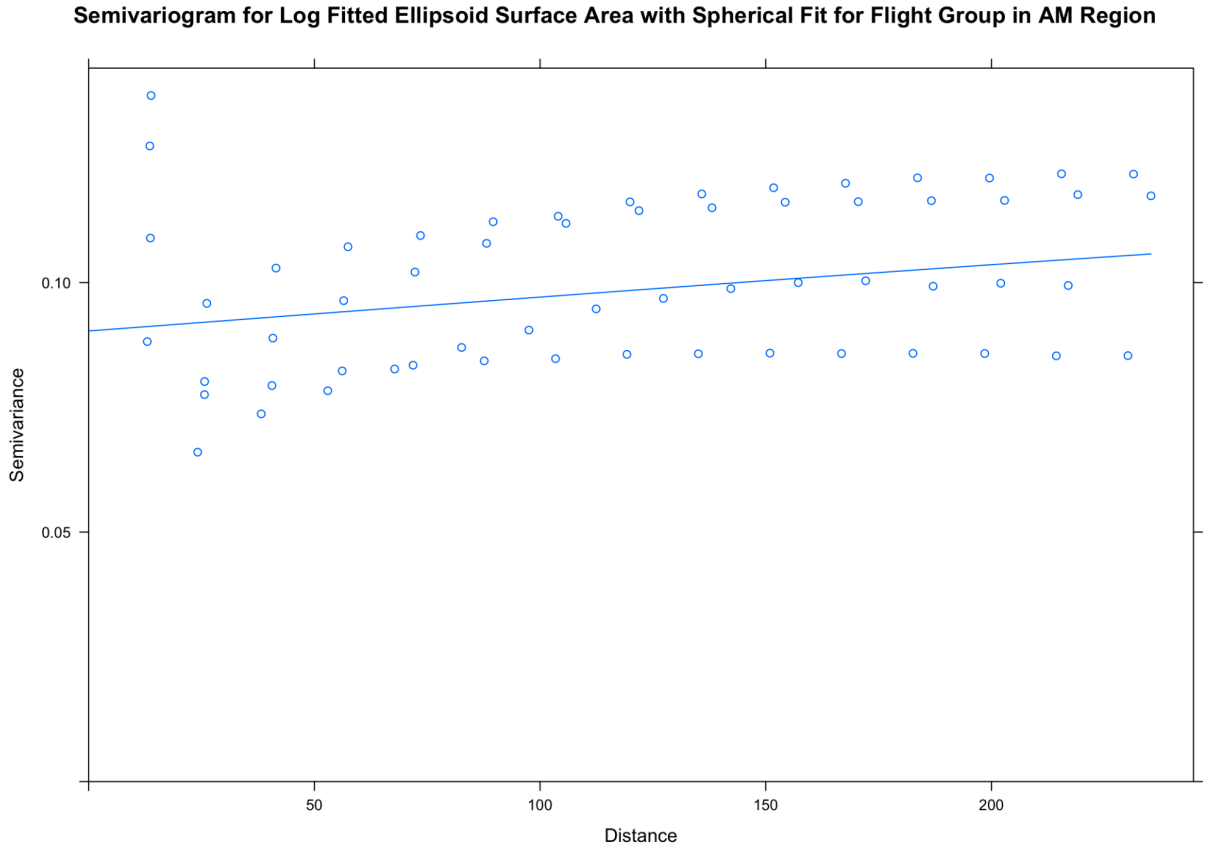
Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

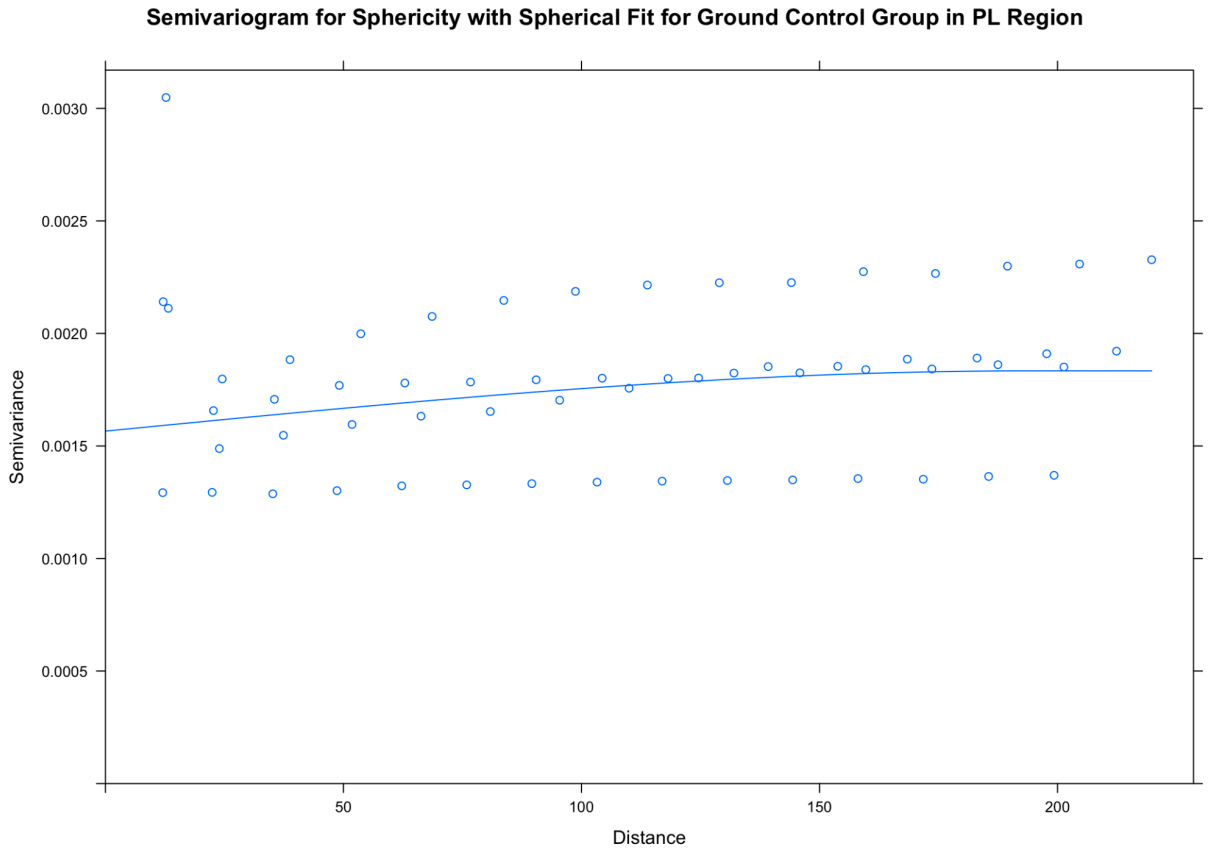


SPHERICITY

1 PL Ground

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick

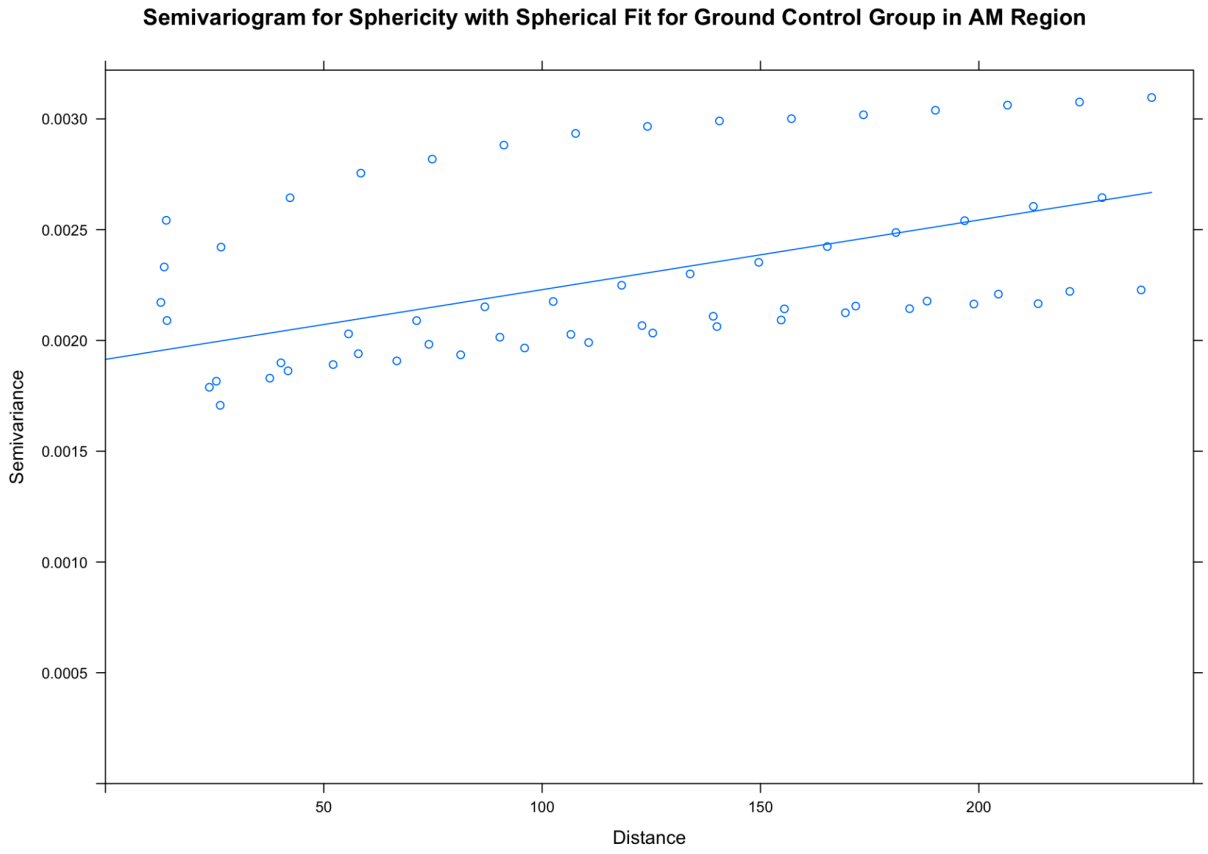


Note: a variogram curve could not be fit to mouse 233 for the sphericity lacunae metric (convergence issues). The curve shown on the plot above is averaged among the variograms curves for mice 238, 252, and 250 only.

<u>2 AM Ground</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

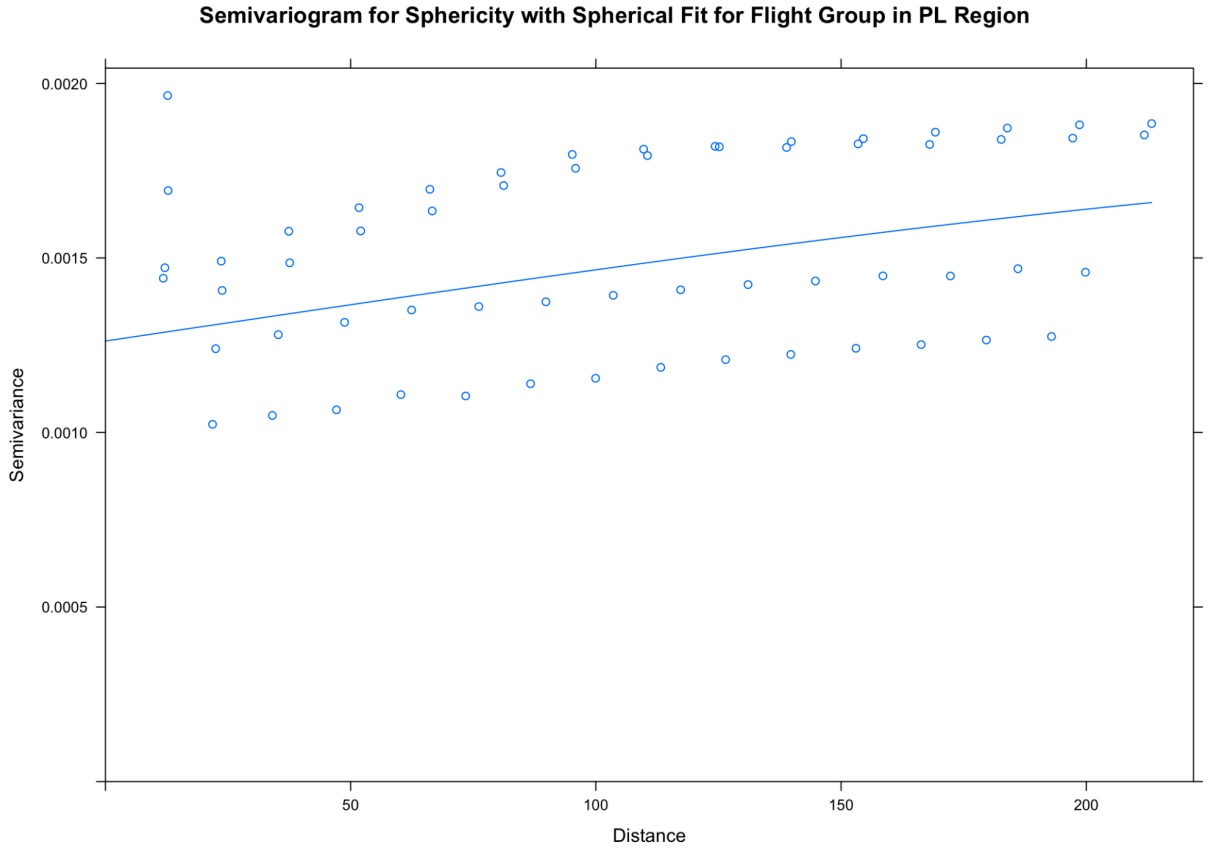
Analyses performed and report written by Sandra Tredinnick



3 PL Flight

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick



<u>4 AM Flight</u>

*Note: for semivariogram plots, I provide an example of how to interpret them; I do not interpret every plot as there are too many and all of them will not be included in the paper.

Analyses performed and report written by Sandra Tredinnick