Supplementary Figures

Title: Organic Matter Transformations are Disconnected Between Surface Water and the Hyporheic Zone

Authors: James C. Stegen[1], Sarah J. Fansler [1], Malak M. Tfaily[4], Vanessa A. Garayburu-Caruso[1], Amy E. Goldman[3], Robert E. Danczak[1], Rosalie K. Chu[2], Lupita Renteria[1], Jerry Tagestad[3], Jason Toyoda[2]

[1]Earth and Biological Sciences Directorate, Pacific Northwest National Laboratory, Richland, WA, U.S.A; james.stegen@pnnl.gov (J.C.S.); sarah.fansler@pnnl.gov (S.J.F.); vanessa.garayburu-caruso@pnnl.gov (V.A.G-C.); robert.danczak@pnnl.gov (R.E.D.); lupita.renteria@pnnl.gov (L.R.);

[2]Environmental Molecular Sciences Laboratory, Richland, WA 99352, USA; Rosalie.Chu@pnnl.gov (R.K.C.);

Jason.Toyoda@pnnl.gov (J.T.)

[3]Energy and Environment Directorate, Pacific Northwest National Laboratory, Richland, WA, U.S.A; amy.goldman@pnnl.gov (A.E.G.); Jerry.Tagestad@pnnl.gov (J.T.)

[4]Department of Environmental Science, University of Arizona, Tucson, AZ, 85719, USA; tfaily@email.arizona.edu (M.M.T.)

Correspondence to: James C. Stegen (James.Stegen@pnnl.gov)

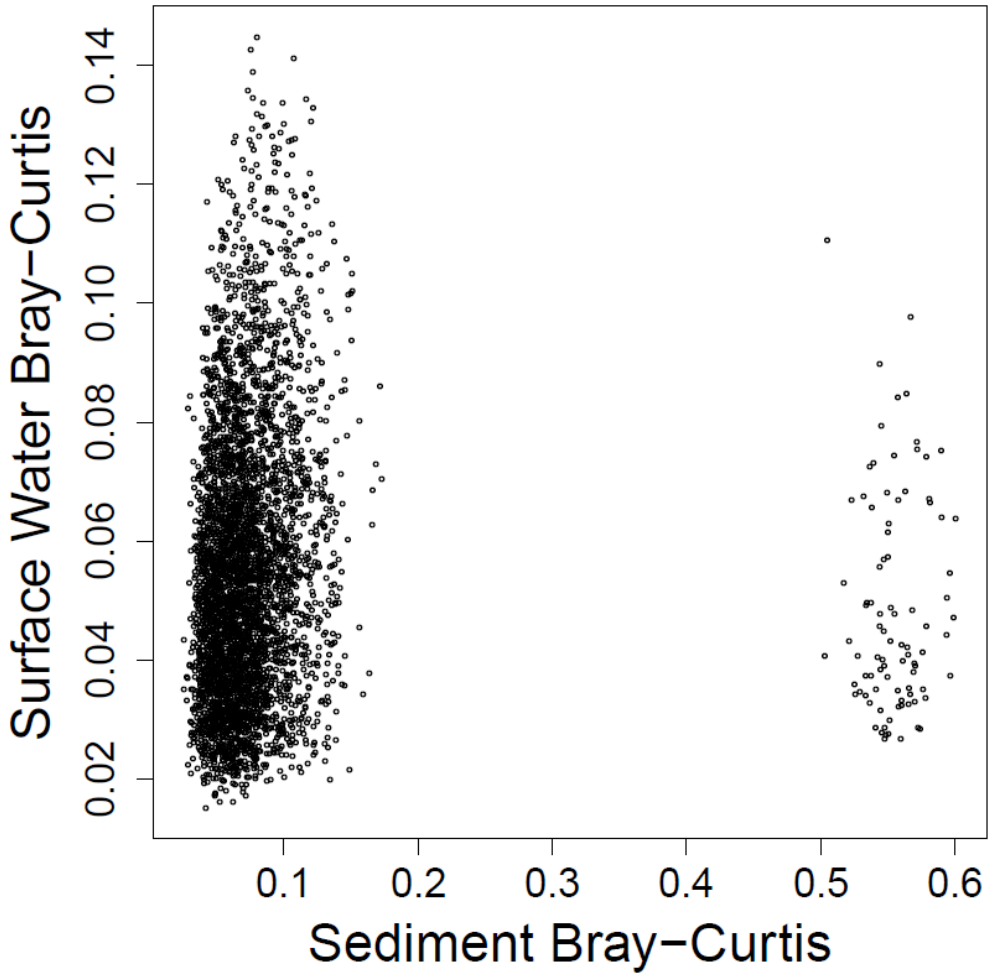
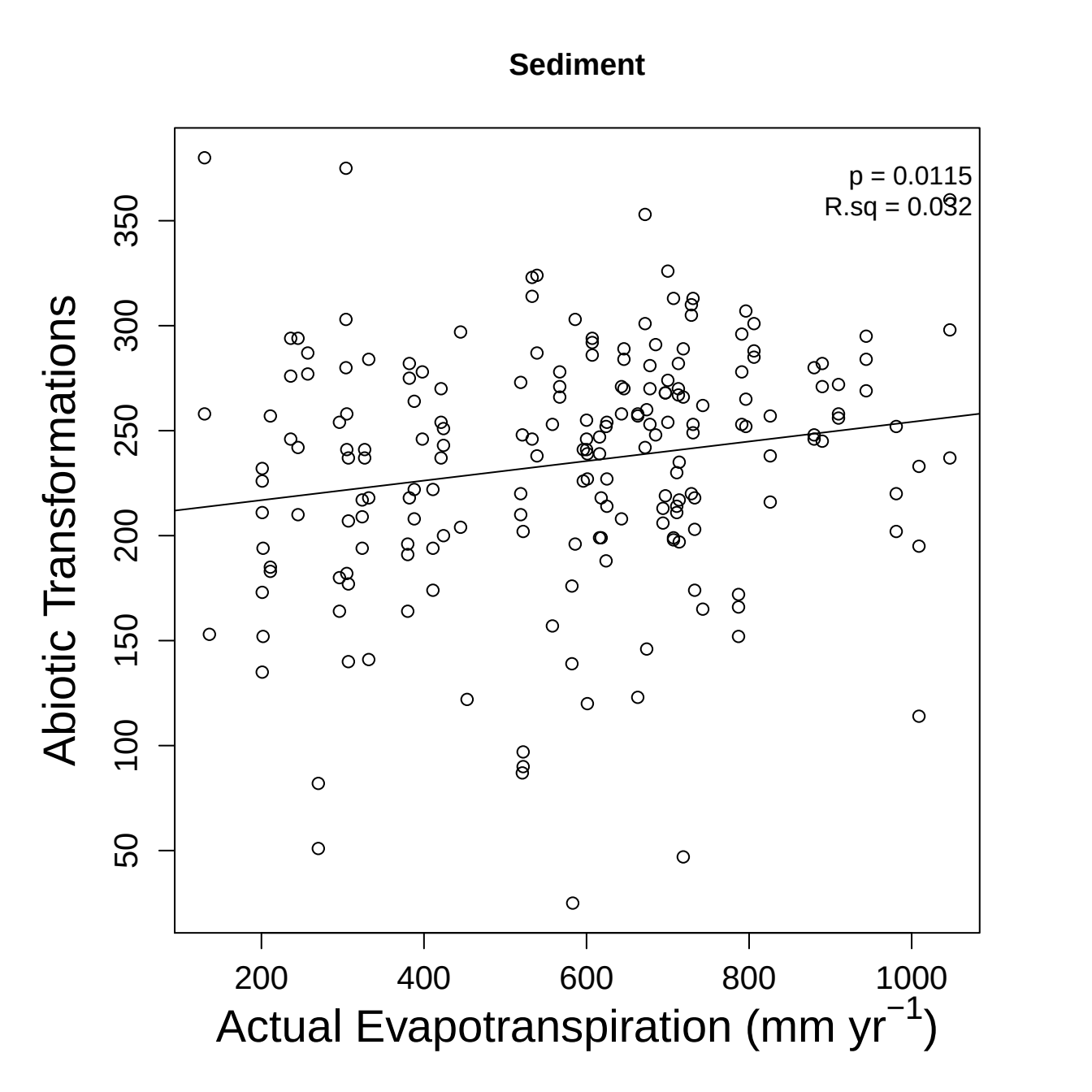
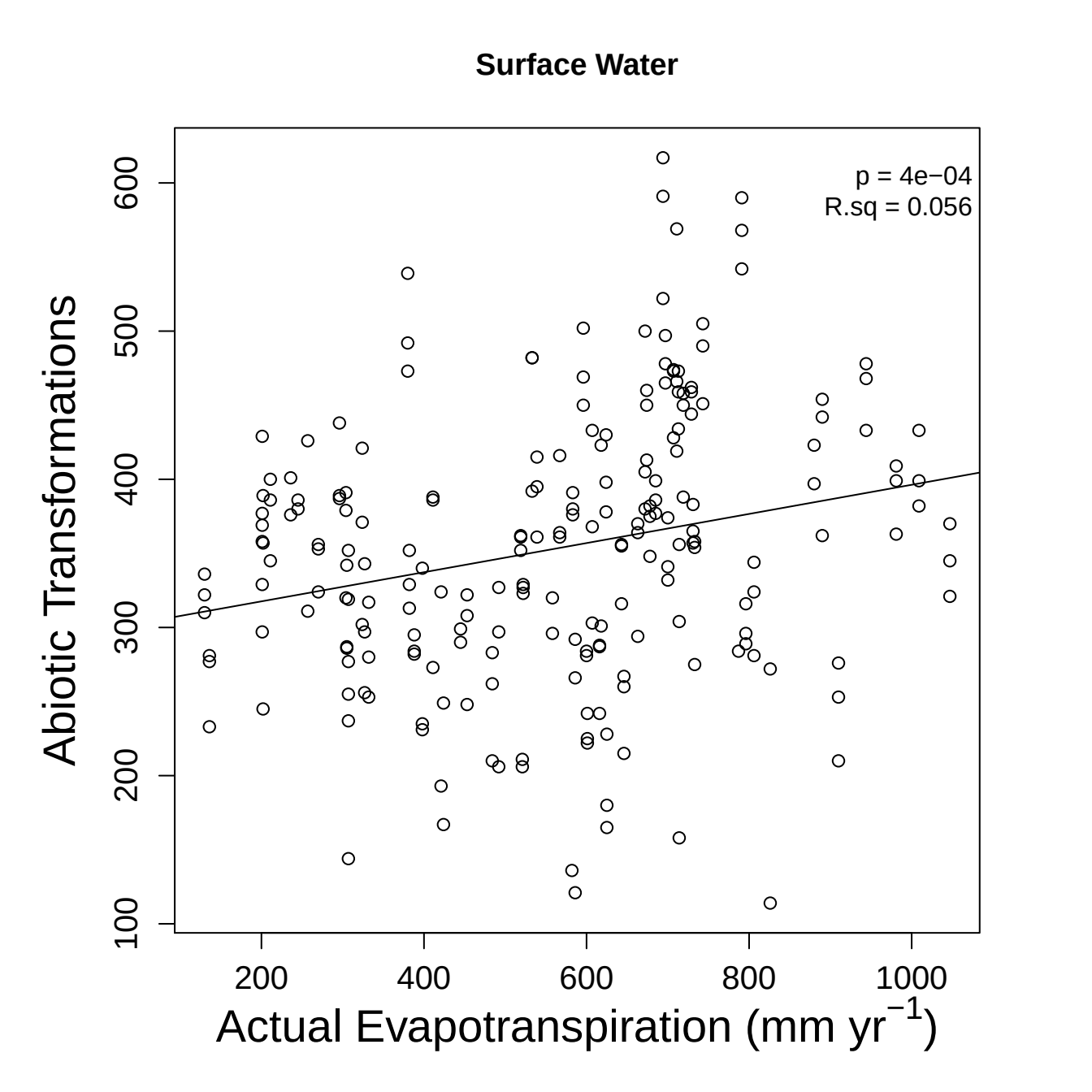
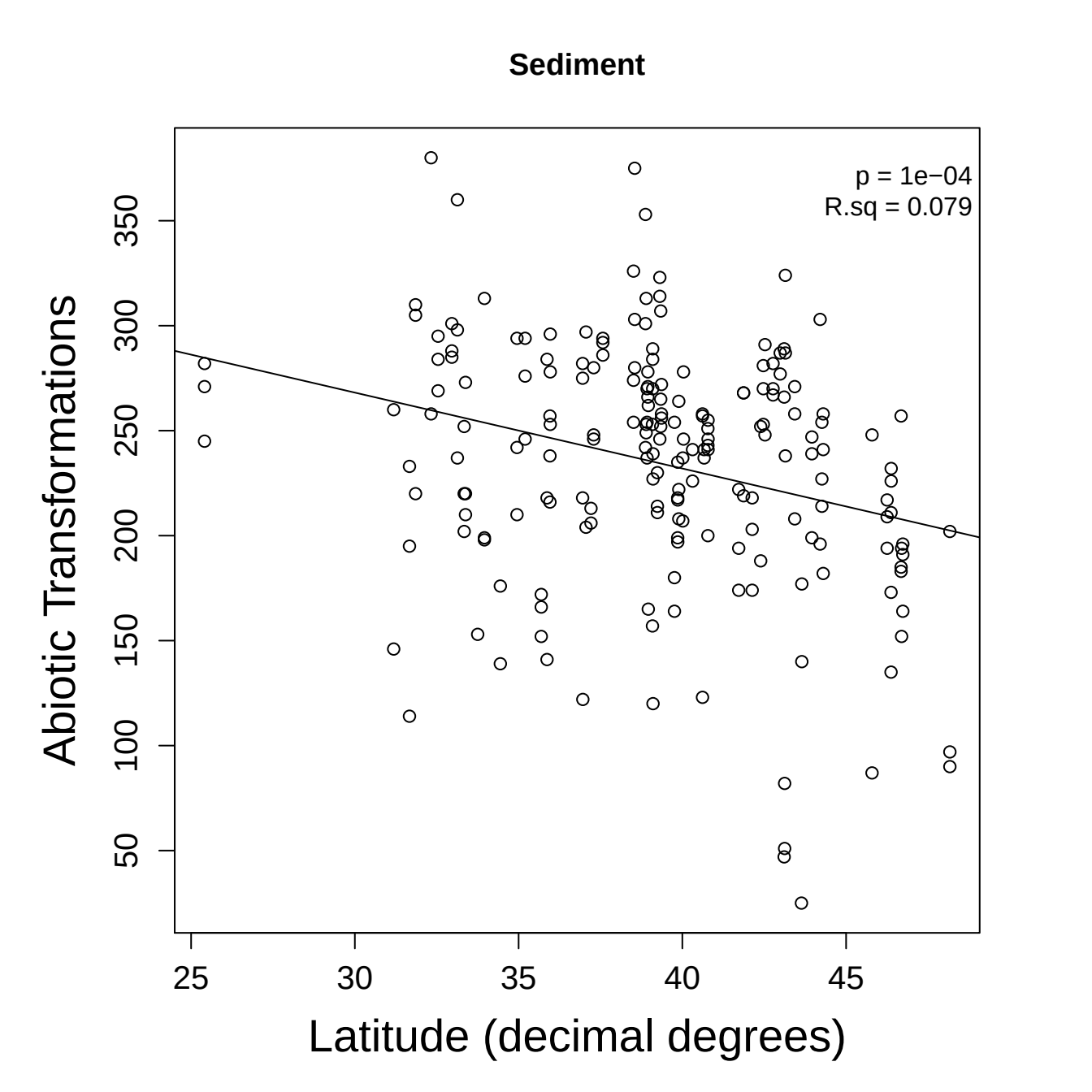


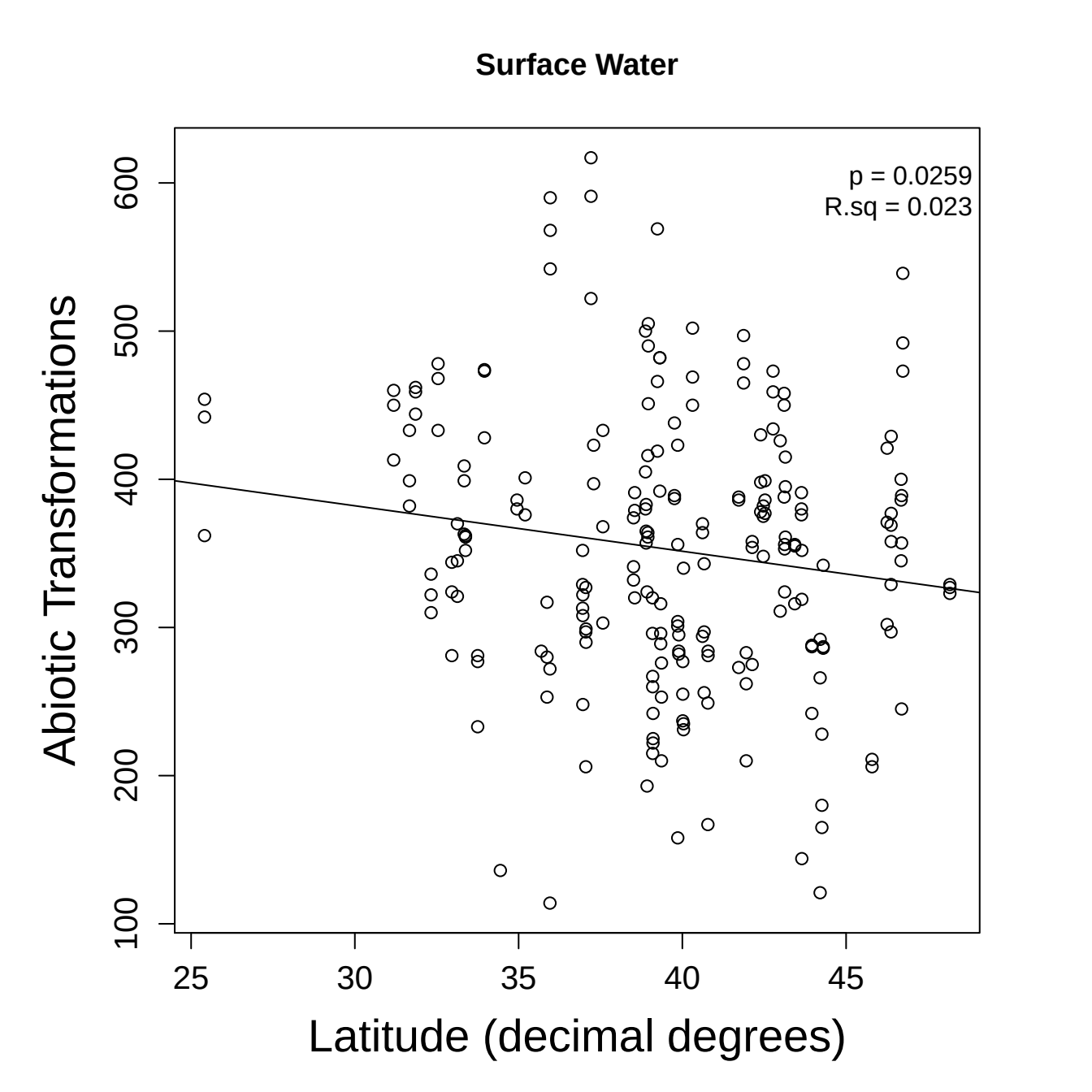
Figure S1 (above). Transformation profiles in sediments and surface water were weakly related to each other. Bray-Curtis dissimilarities in surface water and sediments are plotted against each other. Relative to Figure 4, this figure includes all pairwise comparisons for an outlier sample. The conceptual inference remains the same as that from Figure 4; there is no meaningful relationship between surface water and sediment OM transformation profiles.

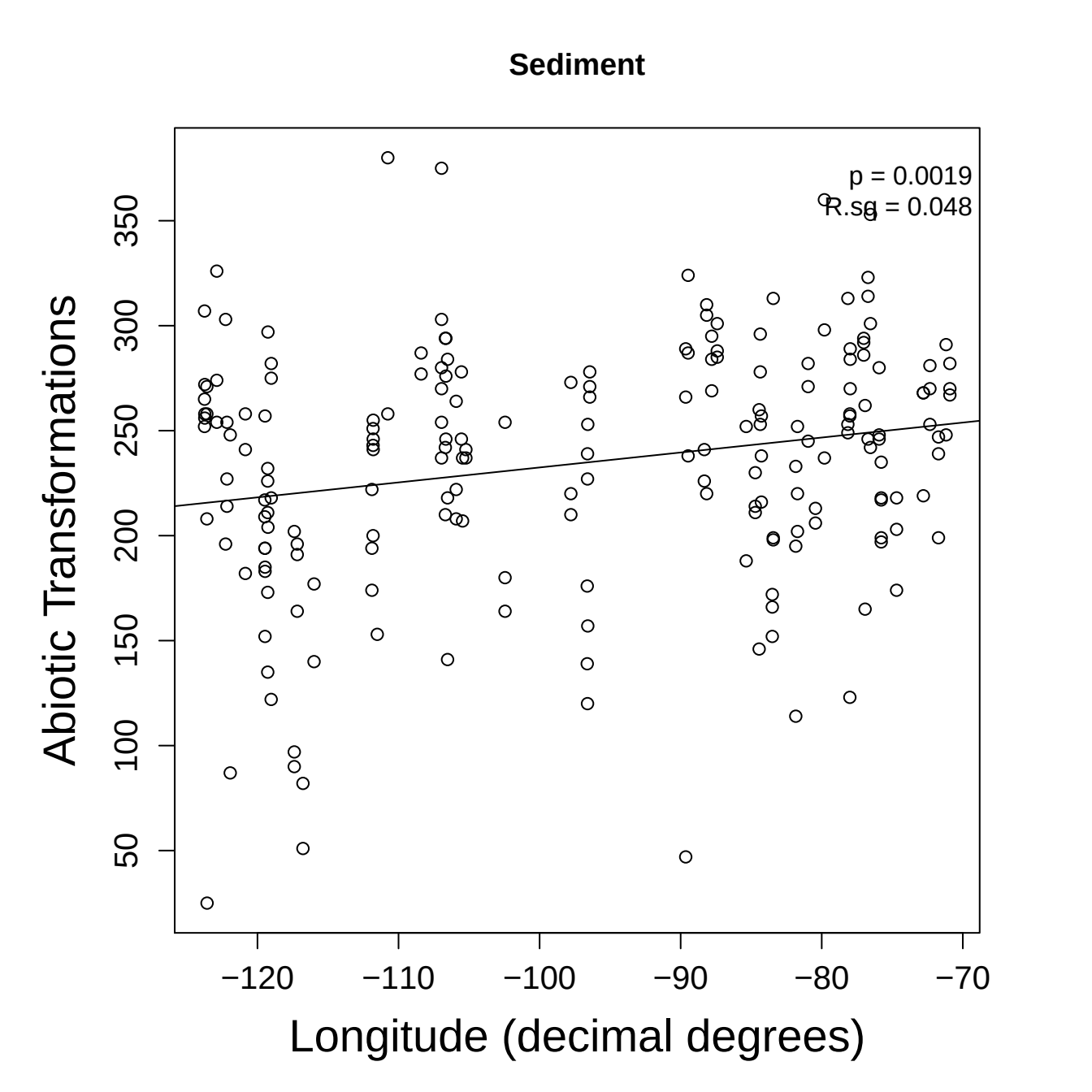
Additional Supplementary Figures (below). Regression analysis for the number of abiotic and biotic transformations related to different potential explanatory variables. Panels use abbreviations and acronyms as follows: sediment (Sed.) and surface water (SW) transformation counts and latitude, longitude, mean annual precipitation (MAP), mean annual temperature (MAT), potential evapotranspiration (PET), and actual evapotranspiration (AET). Each open circle is from one sampling site. Regression statistics are provided on each panel and the solid line represents the regression model, even if it was not significant.

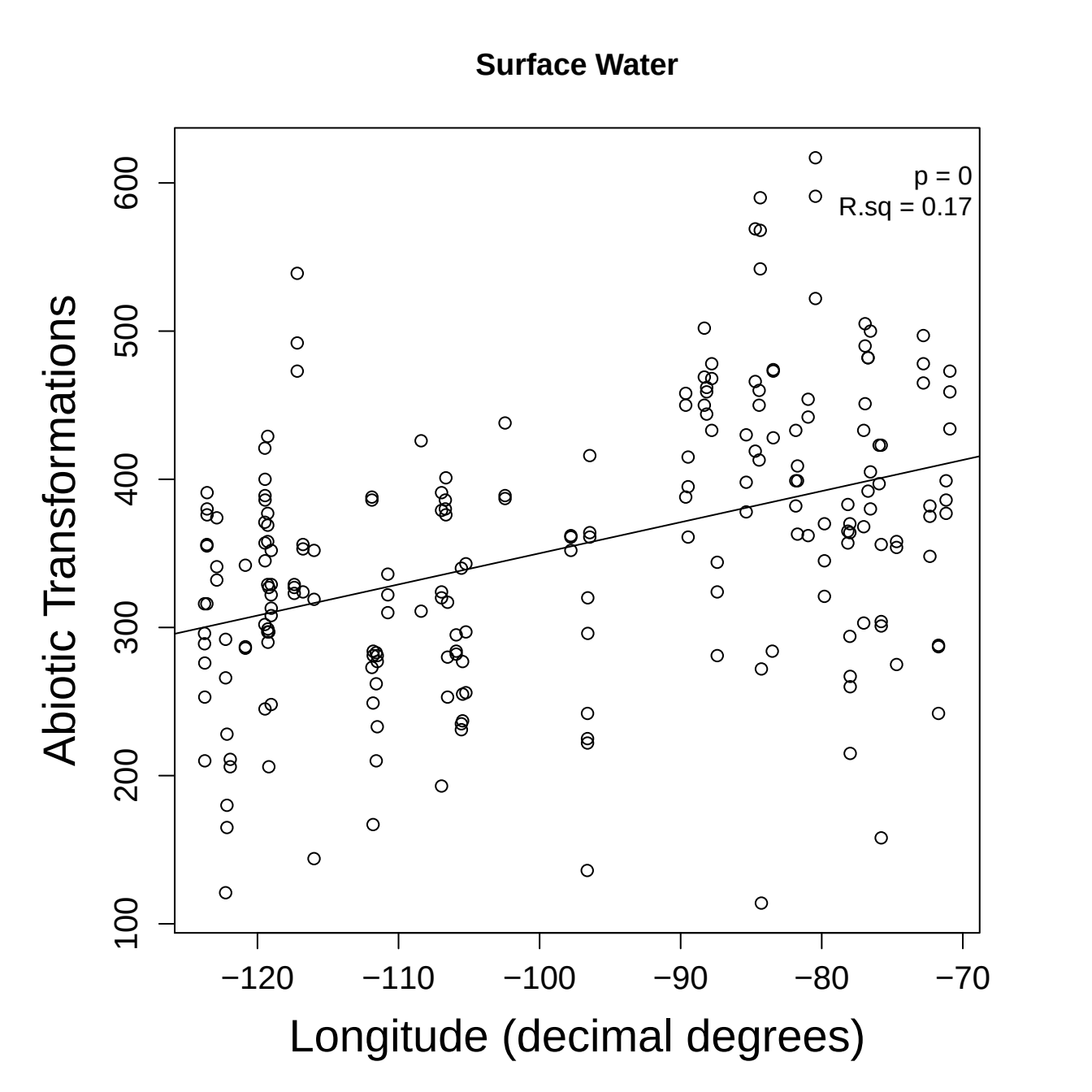

Sediment
p = 0.0115
R.sq = 0.032
Abiotic Transformations
50
100
150
200
250
300
350
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

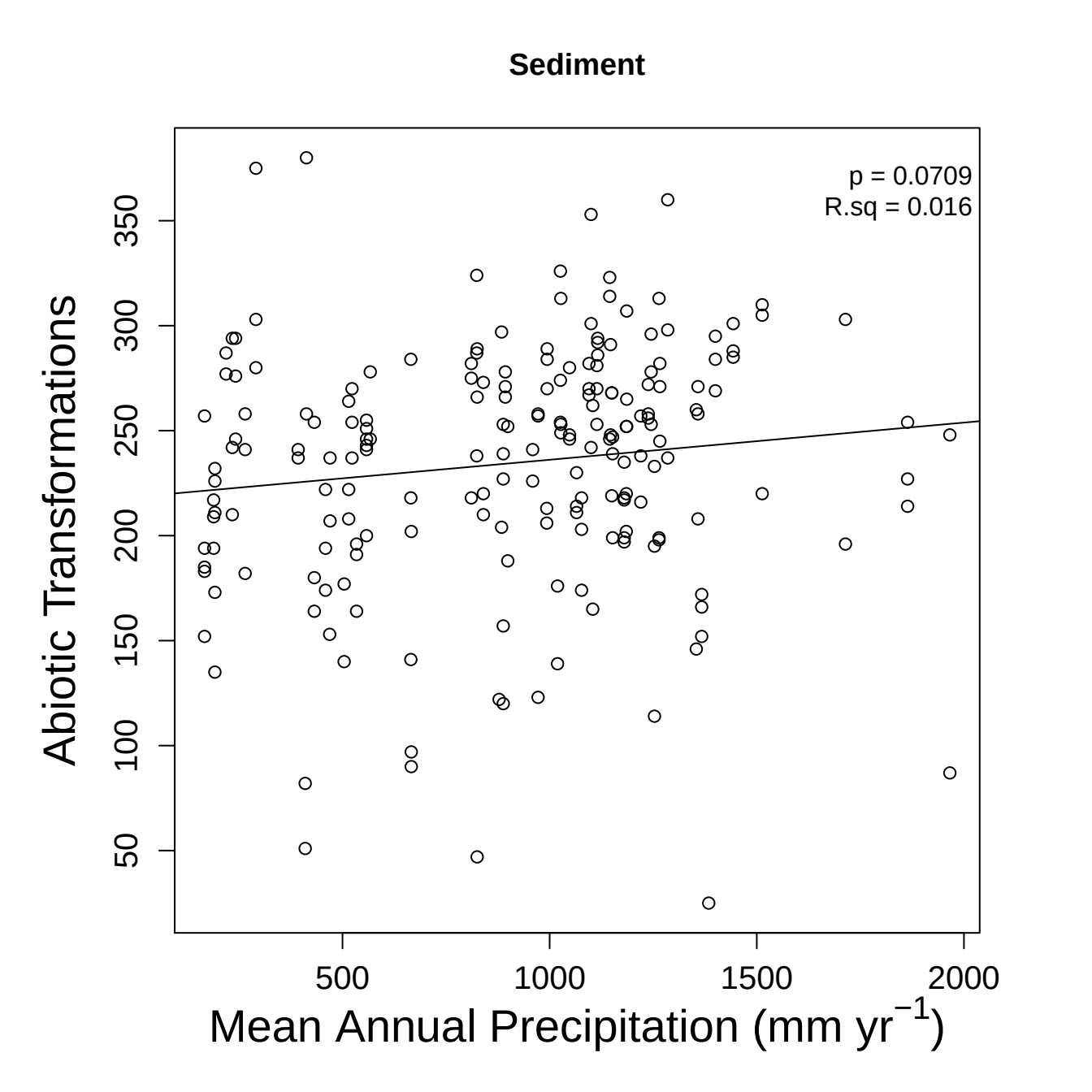

Surface Water
p = 4e−04
R.sq = 0.056
Abiotic Transformations
100
200
300
400
500
600
200
400
600
800
1000
Actual Evapotranspiration (mm yr−1)

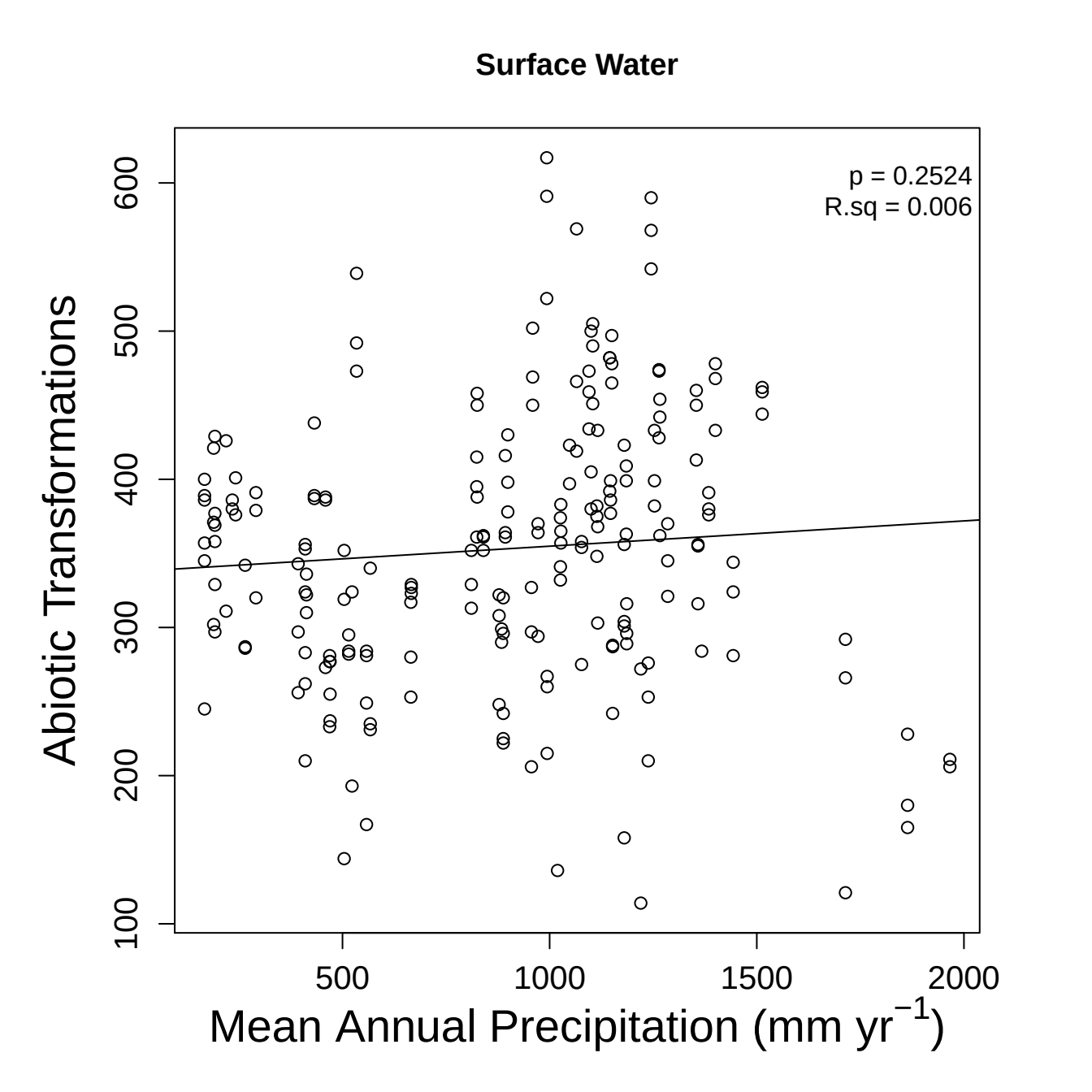

Sediment
p = 1e−04
R.sq = 0.079
Abiotic Transformations
50
100
150
200
250
300
350
25
30
35
40
45
Latitude (decimal degrees)

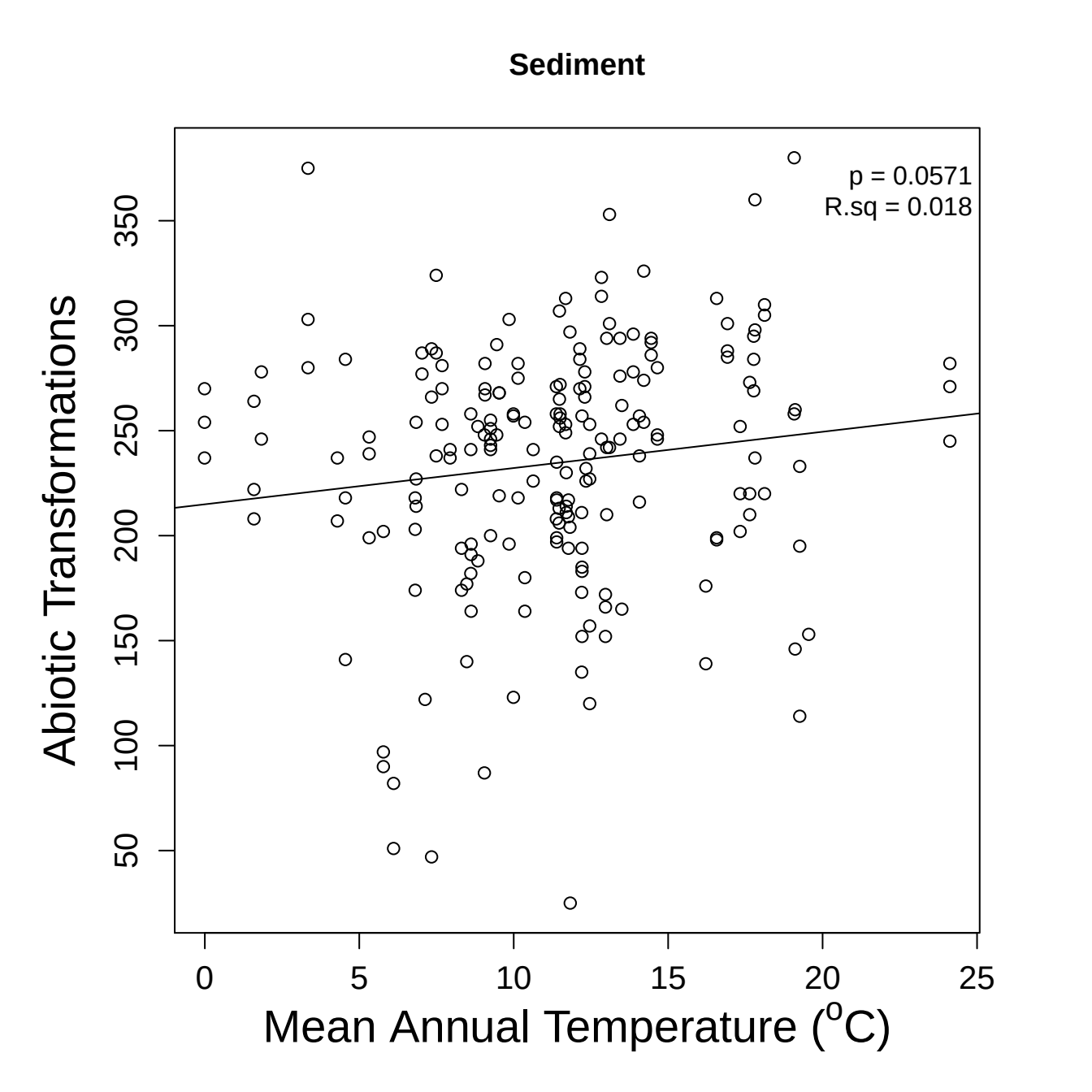

Surface Water
p = 0.0259
R.sq = 0.023
Abiotic Transformations
100
200
300
400
500
600
25
30
35
40
45
Latitude (decimal degrees)

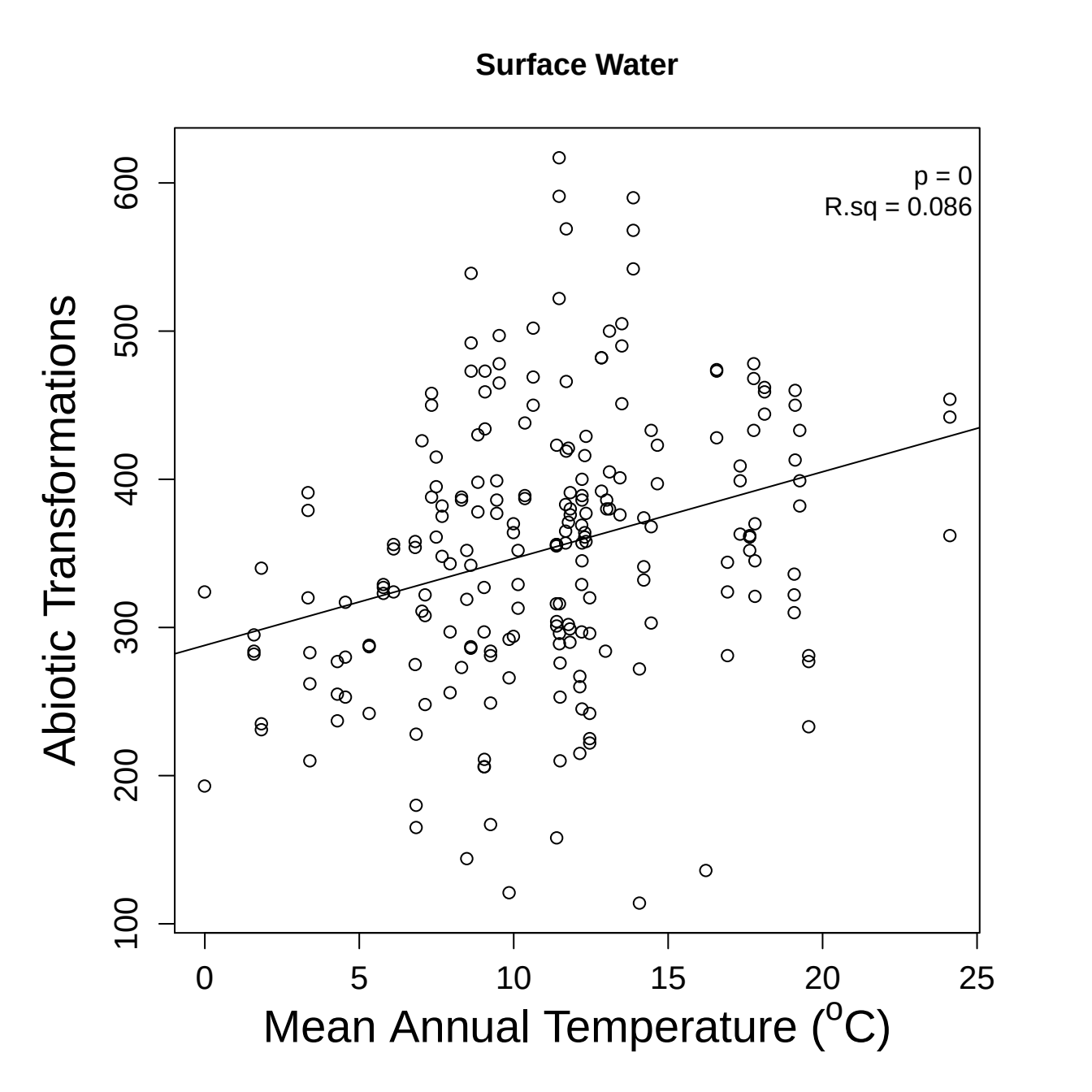

Sediment
p = 0.0019
R.sq = 0.048
Abiotic Transformations
50
100
150
200
250
300
350
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

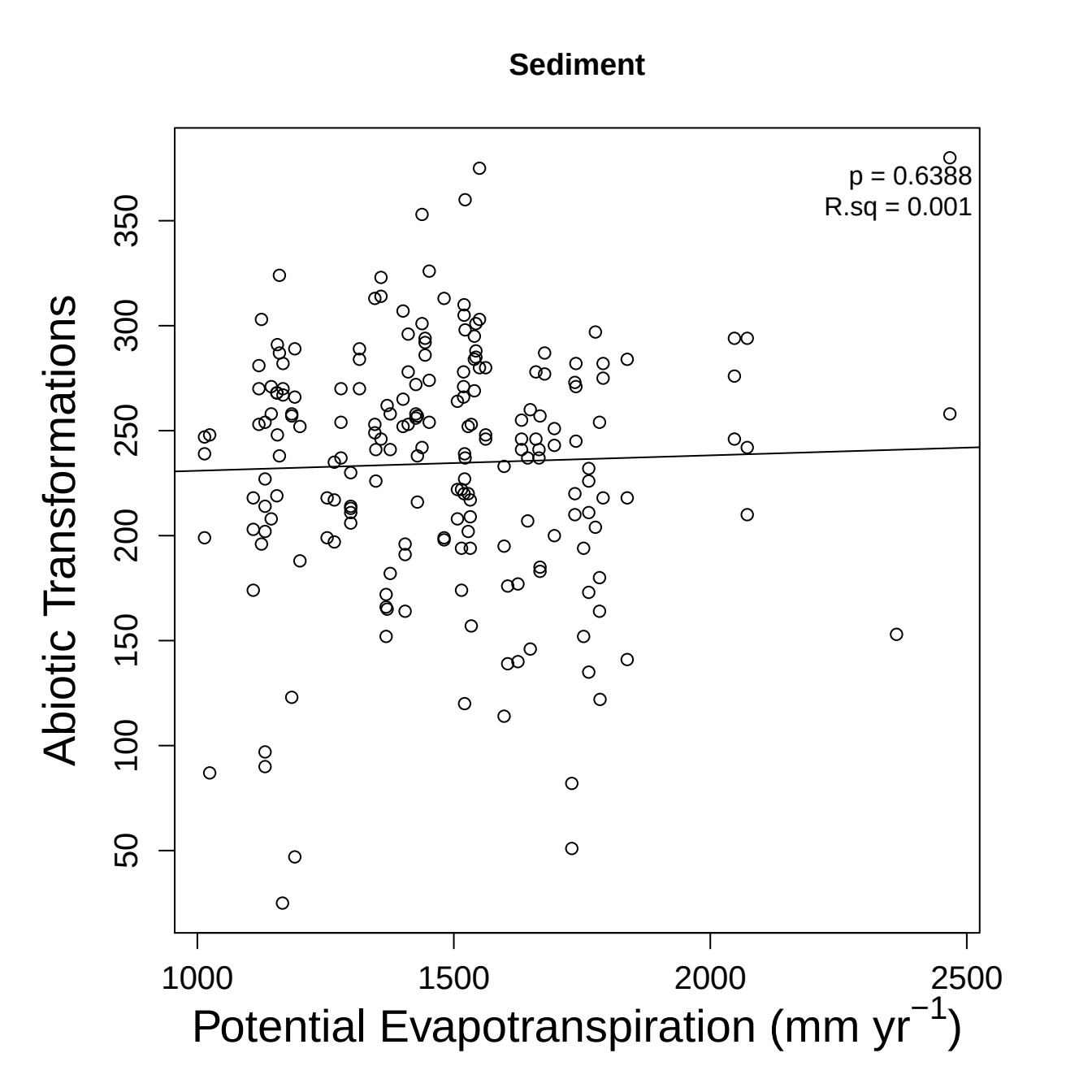

Surface Water
p = 0
R.sq = 0.17
Abiotic Transformations
100
200
300
400
500
600
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

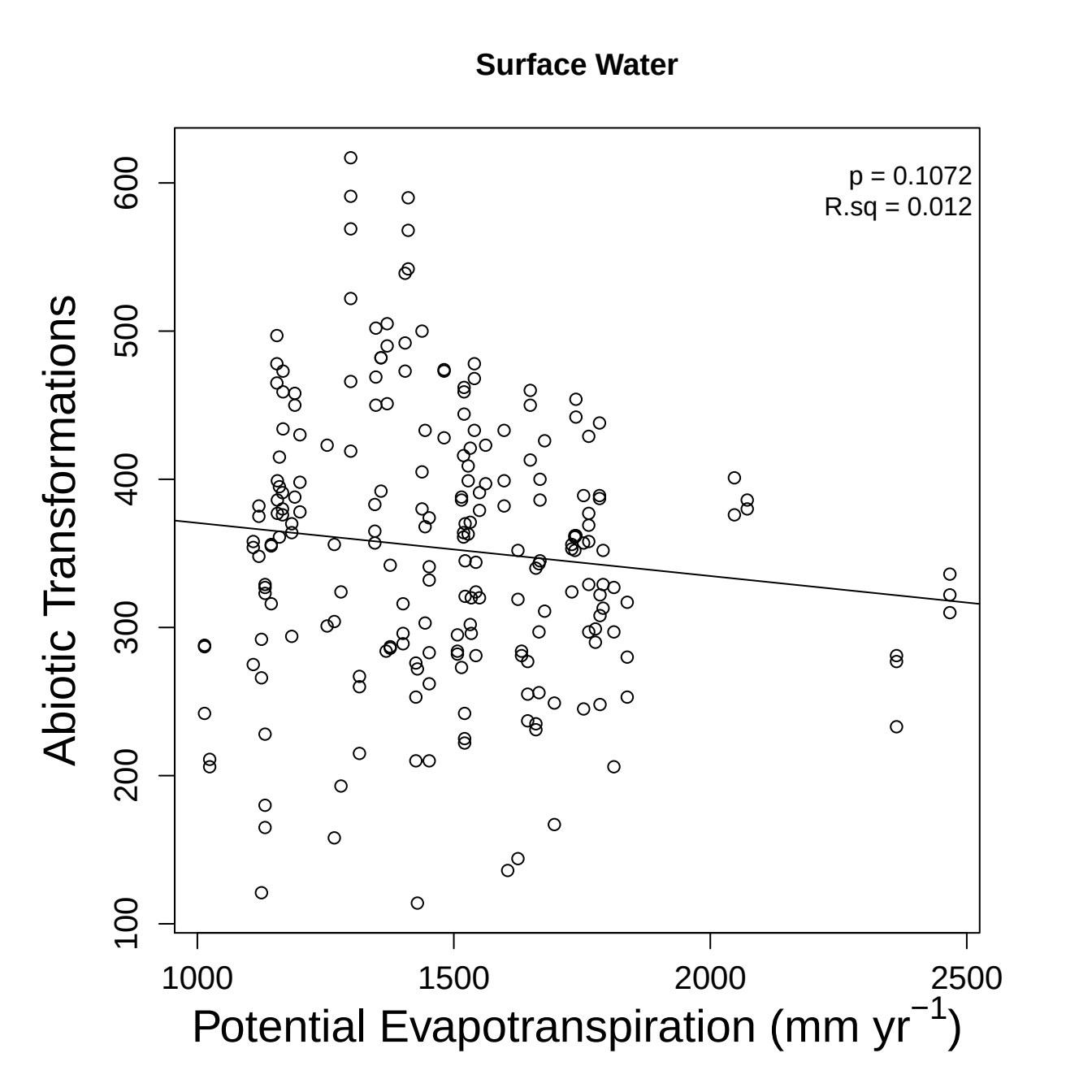

Sediment
p = 0.0709
R.sq = 0.016
Abiotic Transformations
50
100
150
200
250
300
350
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

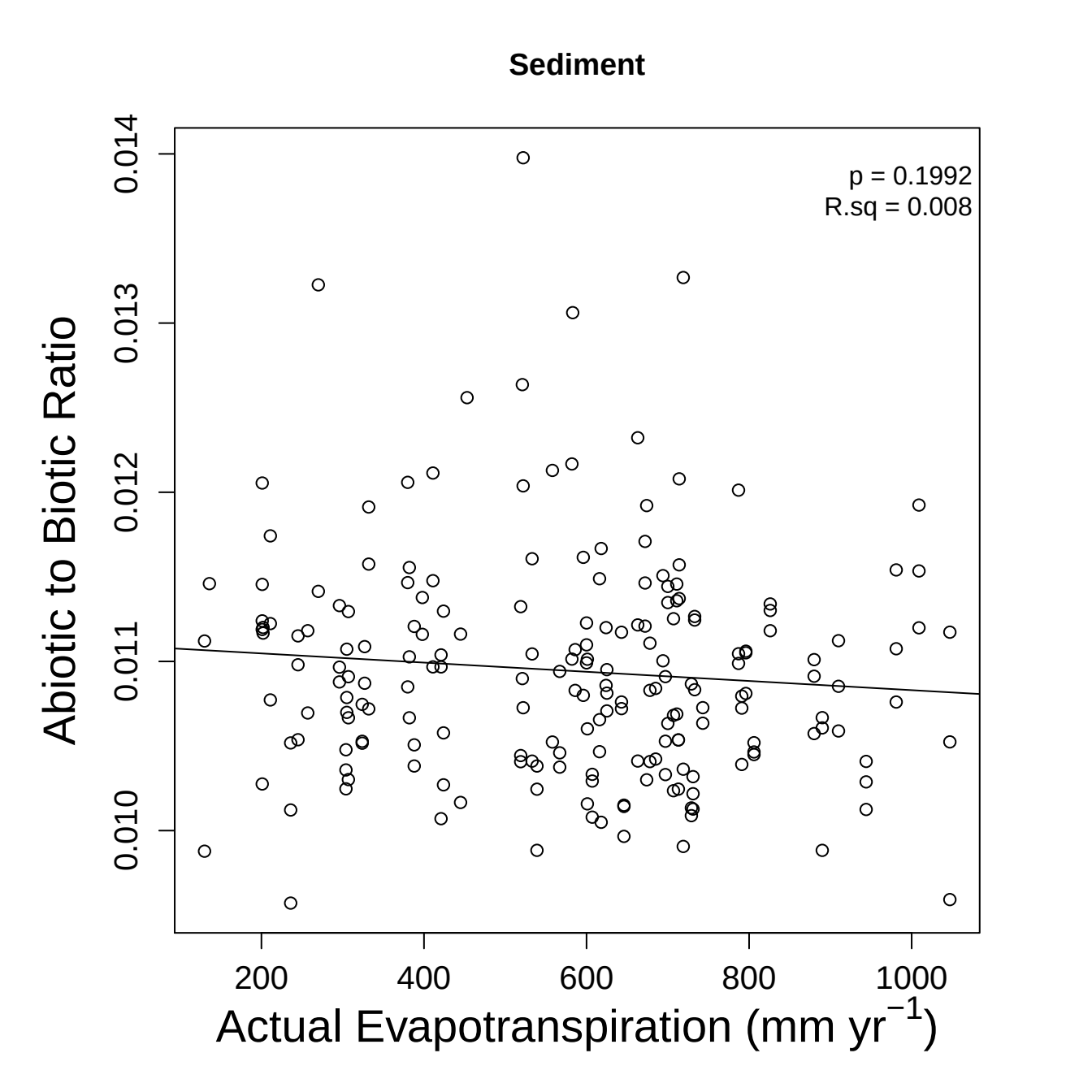

Surface Water
p = 0.2524
R.sq = 0.006
Abiotic Transformations
100
200
300
400
500
600
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

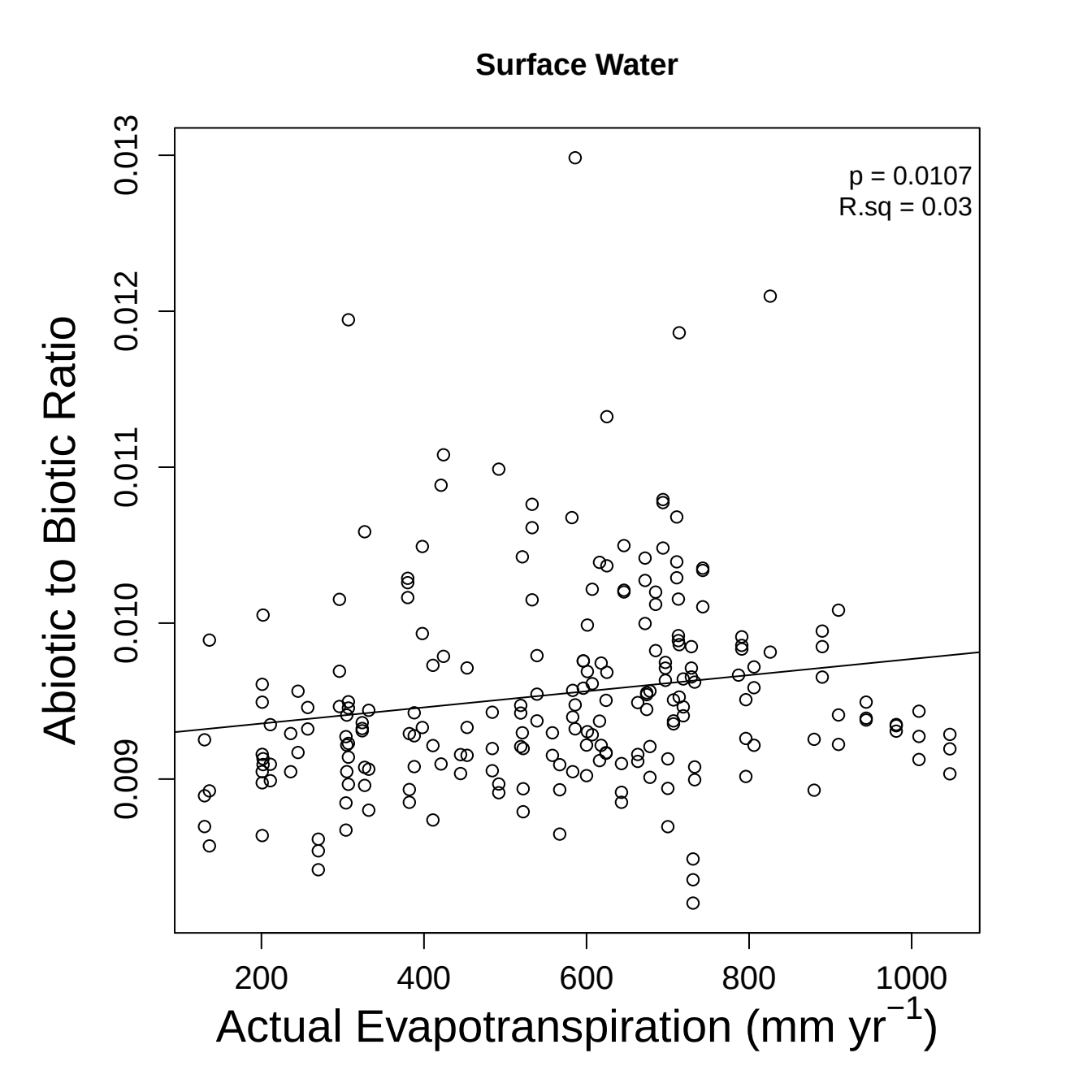

Sediment
p = 0.0571
R.sq = 0.018
Abiotic Transformations
50
100
150
200
250
300
350
0
5
10
15
20
25
Mean Annual Temperature (°C)

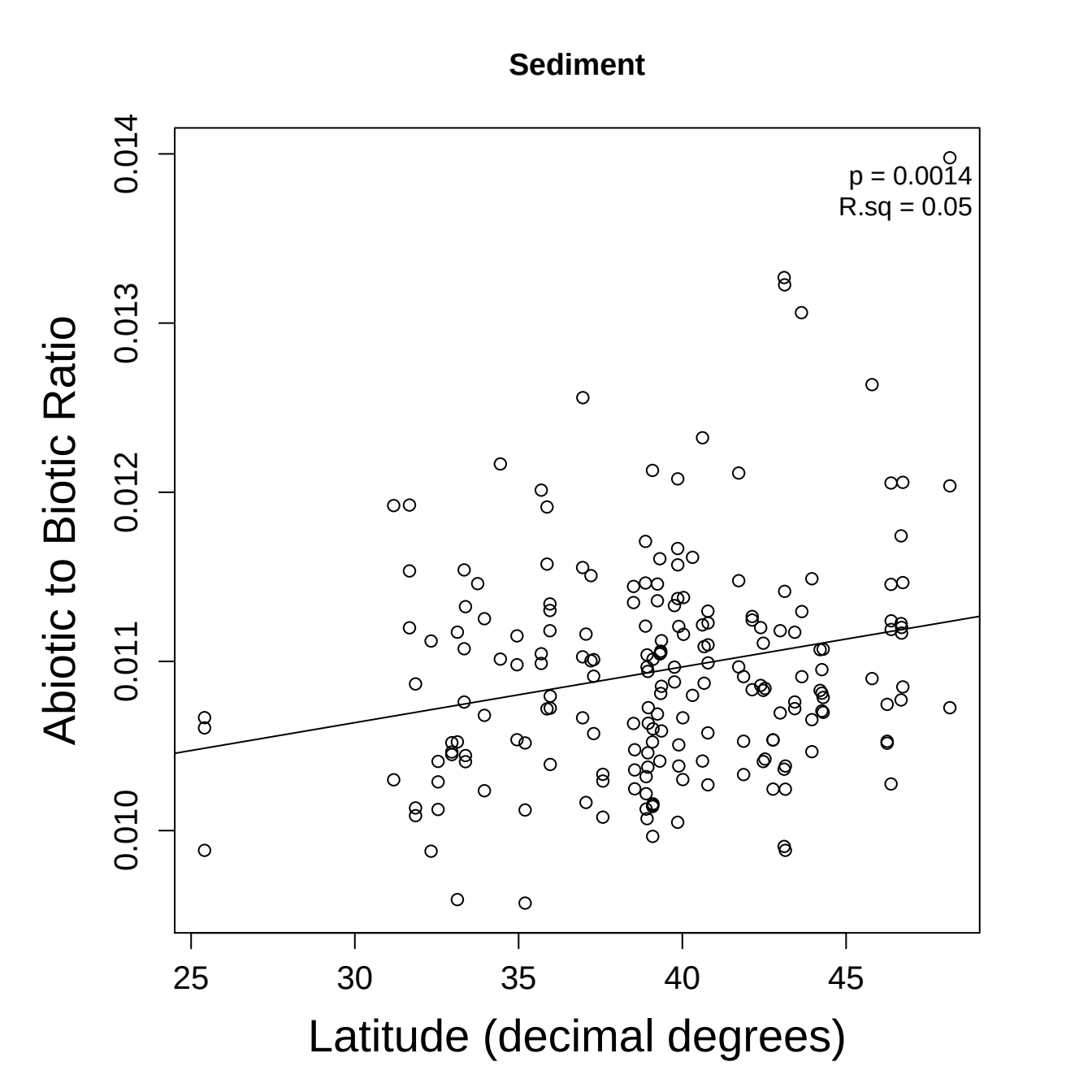

Surface Water
p = 0
R.sq = 0.086
Abiotic Transformations
100
200
300
400
500
600
0
5
10
15
20
25
Mean Annual Temperature (°C)

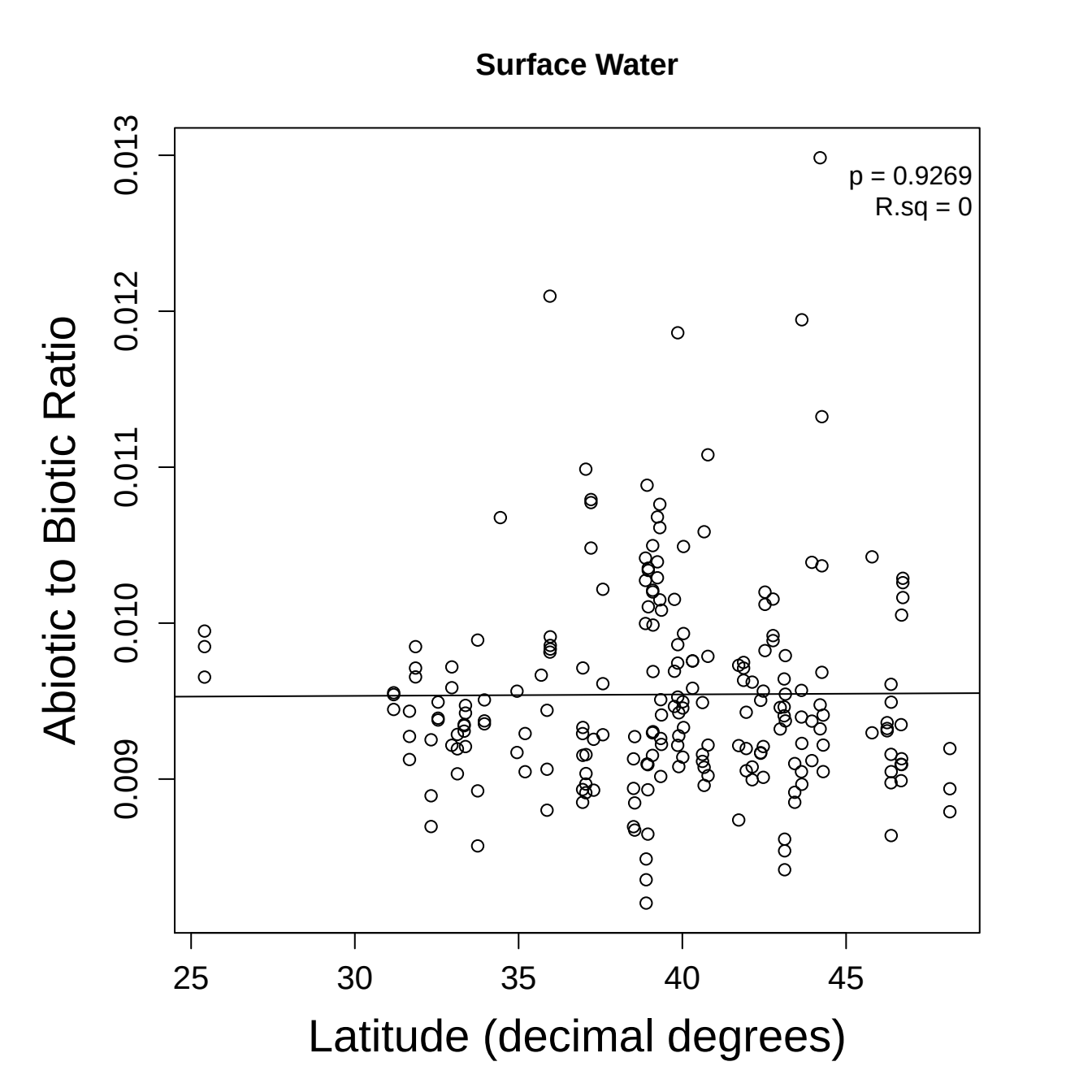

Sediment
p = 0.6388
R.sq = 0.001
Abiotic Transformations
50
100
150
200
250
300
350
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

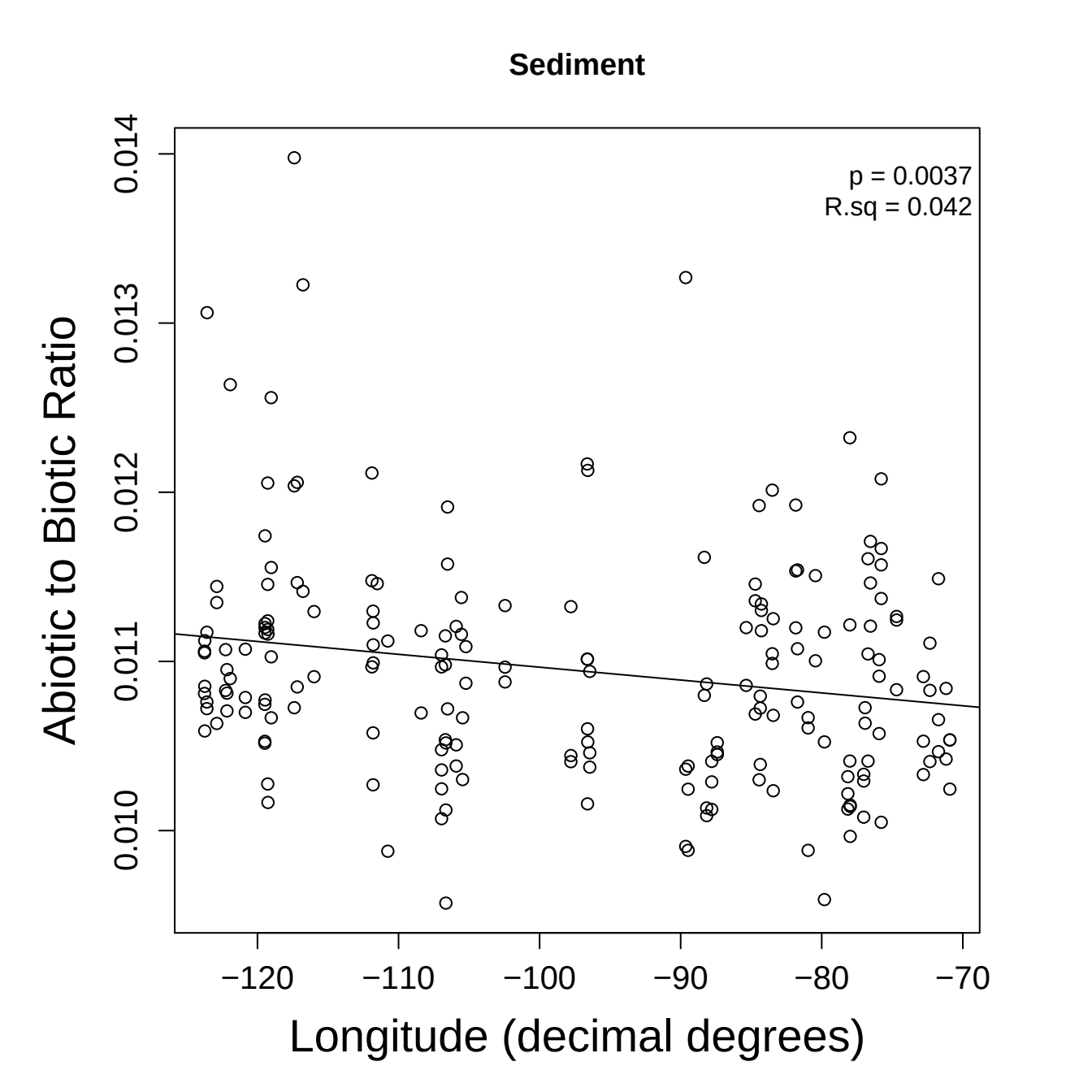

Surface Water
p = 0.1072
R.sq = 0.012
Abiotic Transformations
100
200
300
400
500
600
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

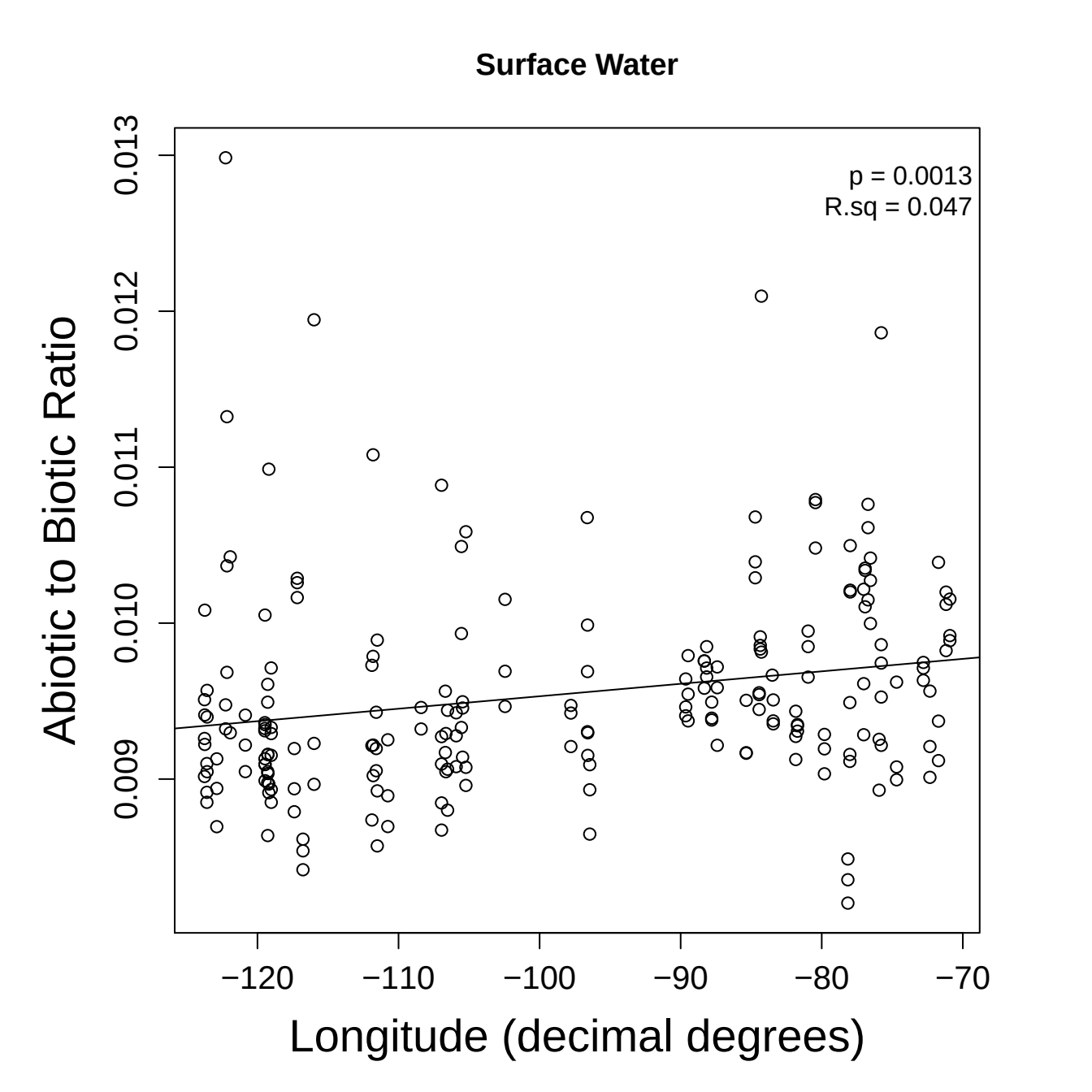

Sediment
p = 0.1992
R.sq = 0.008
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

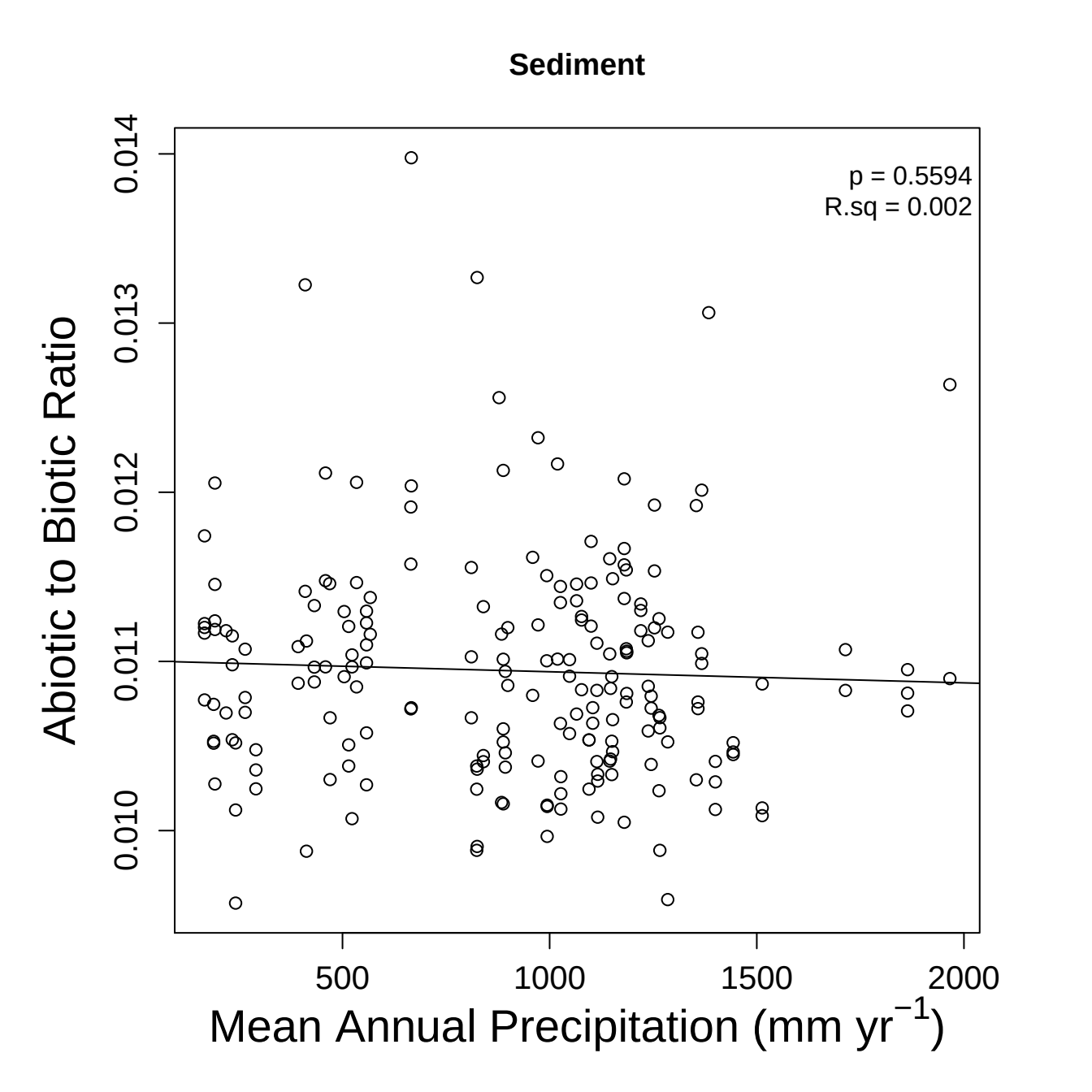

Surface Water
p = 0.0107
R.sq = 0.03
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

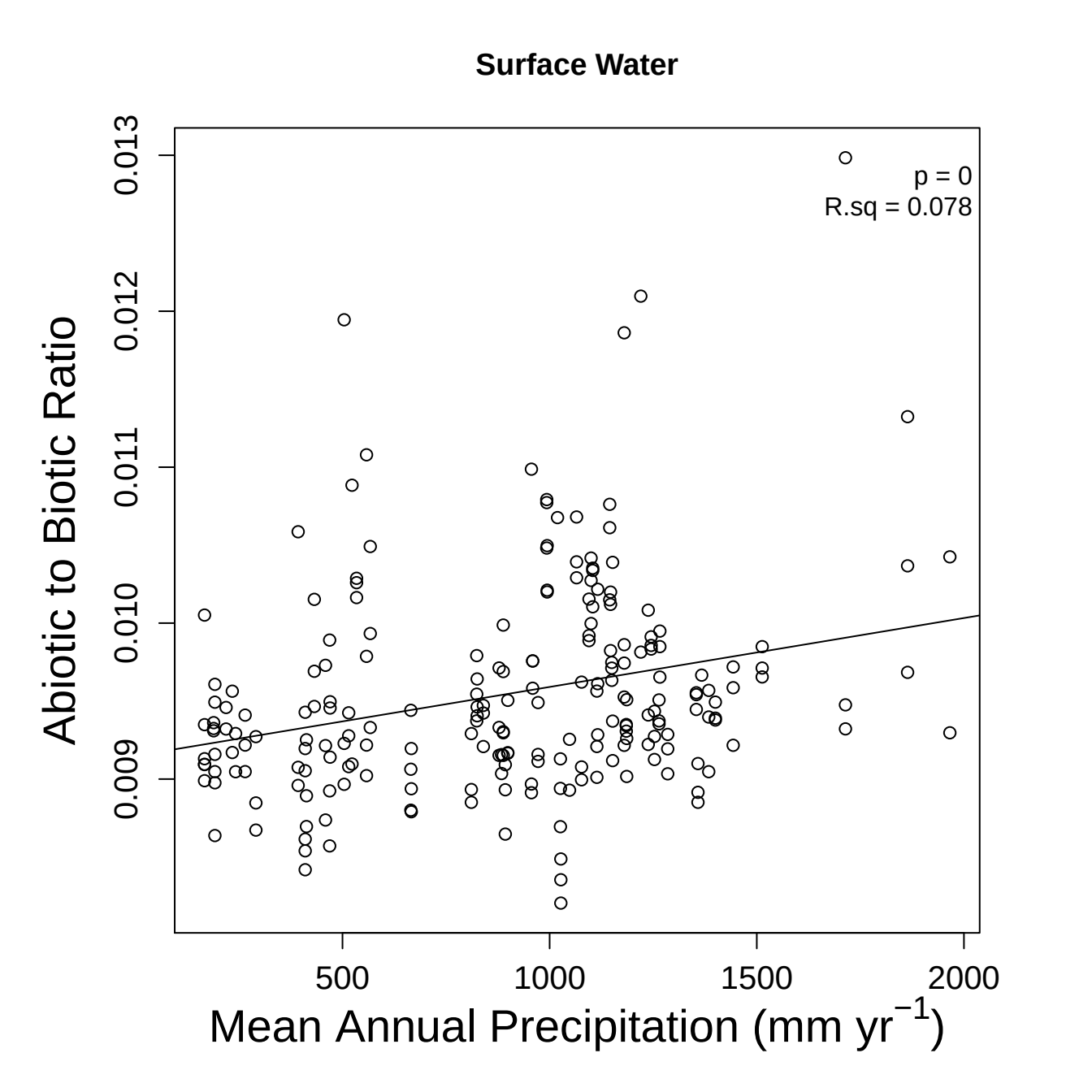

Sediment
p = 0.0014
R.sq = 0.05
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
25
30
35
40
45
Latitude (decimal degrees)

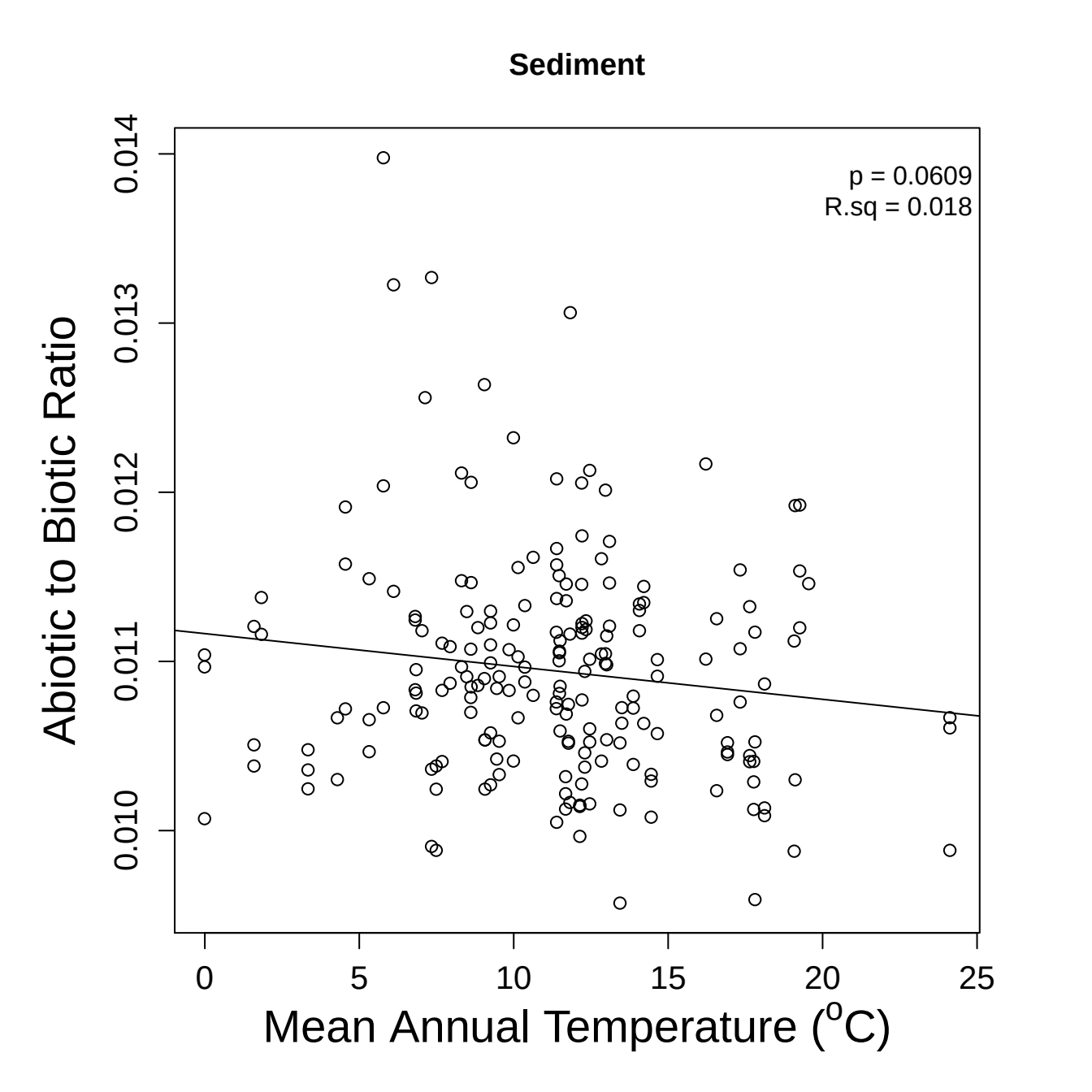

Surface Water
p = 0.9269
R.sq = 0
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
25
30
35
40
45
Latitude (decimal degrees)

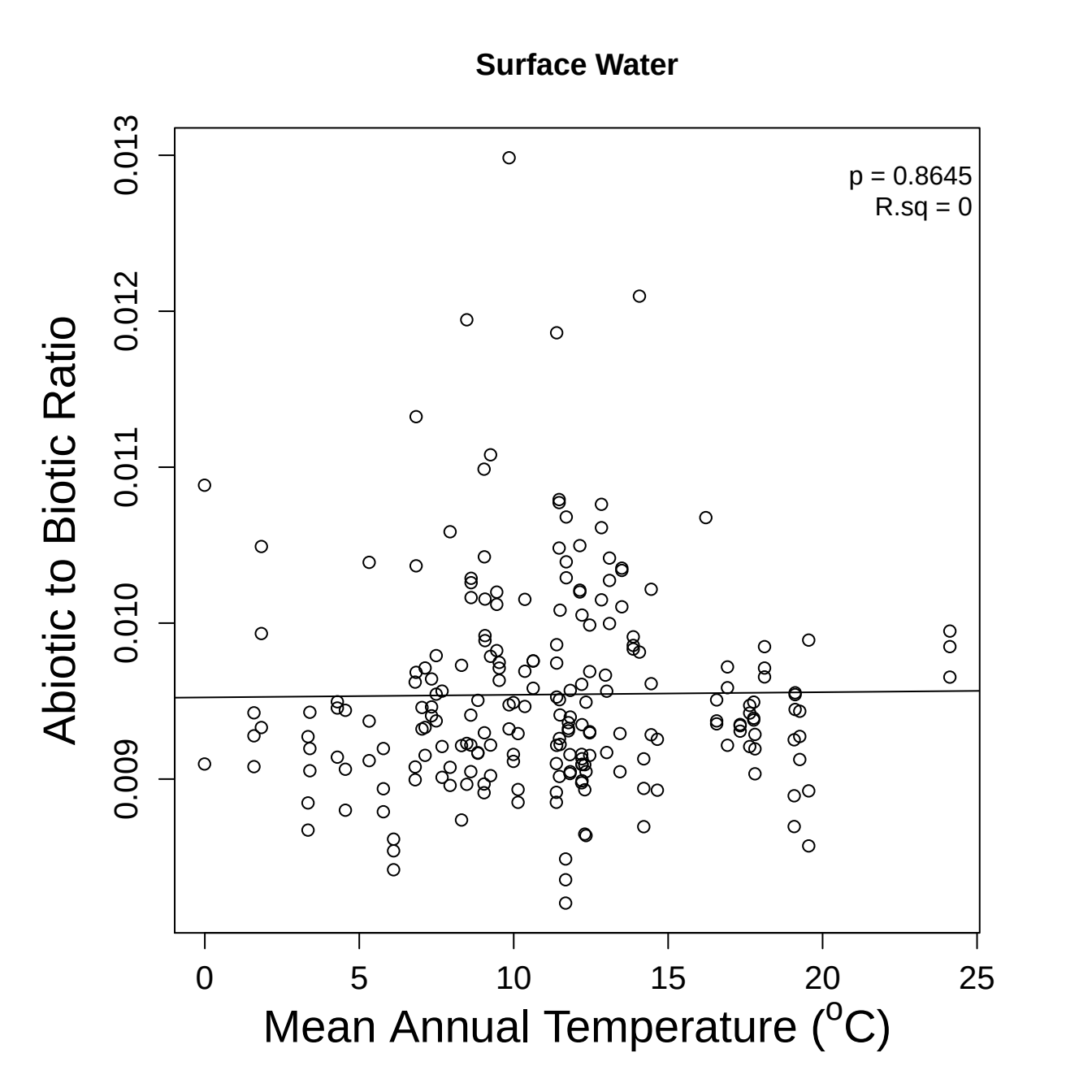

Sediment
p = 0.0037
R.sq = 0.042
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

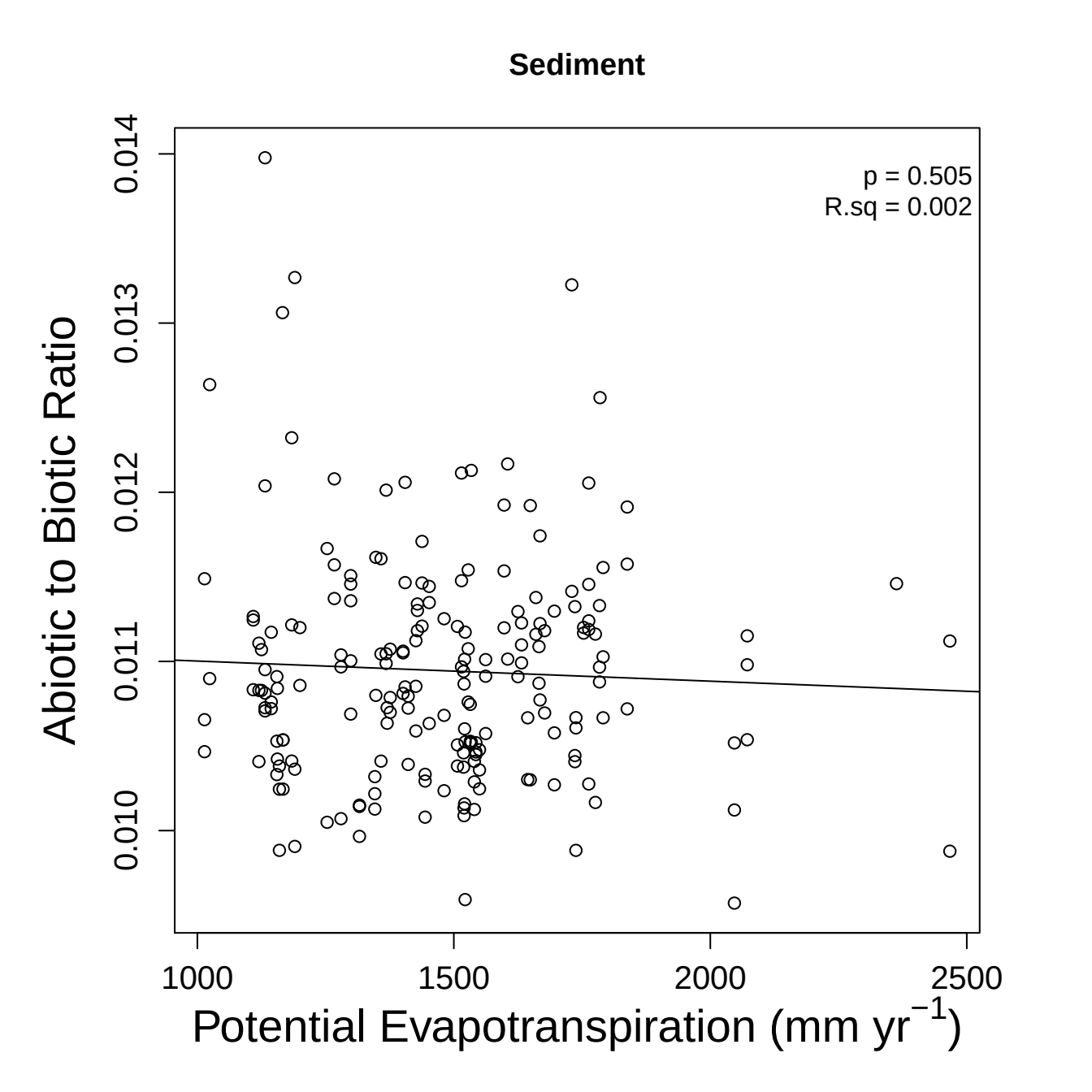

Surface Water
p = 0.0013
R.sq = 0.047
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

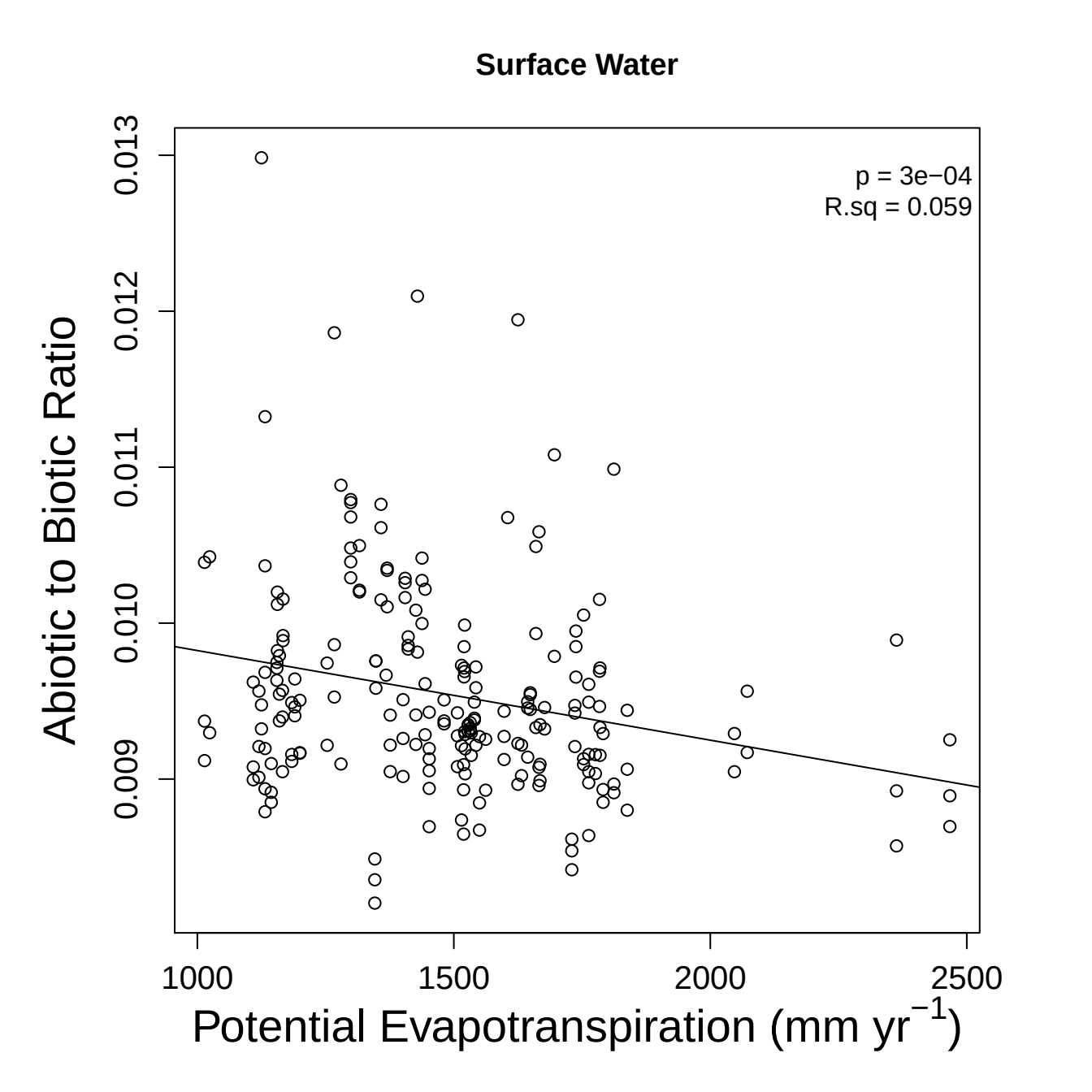

Sediment
p = 0.5594
R.sq = 0.002
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

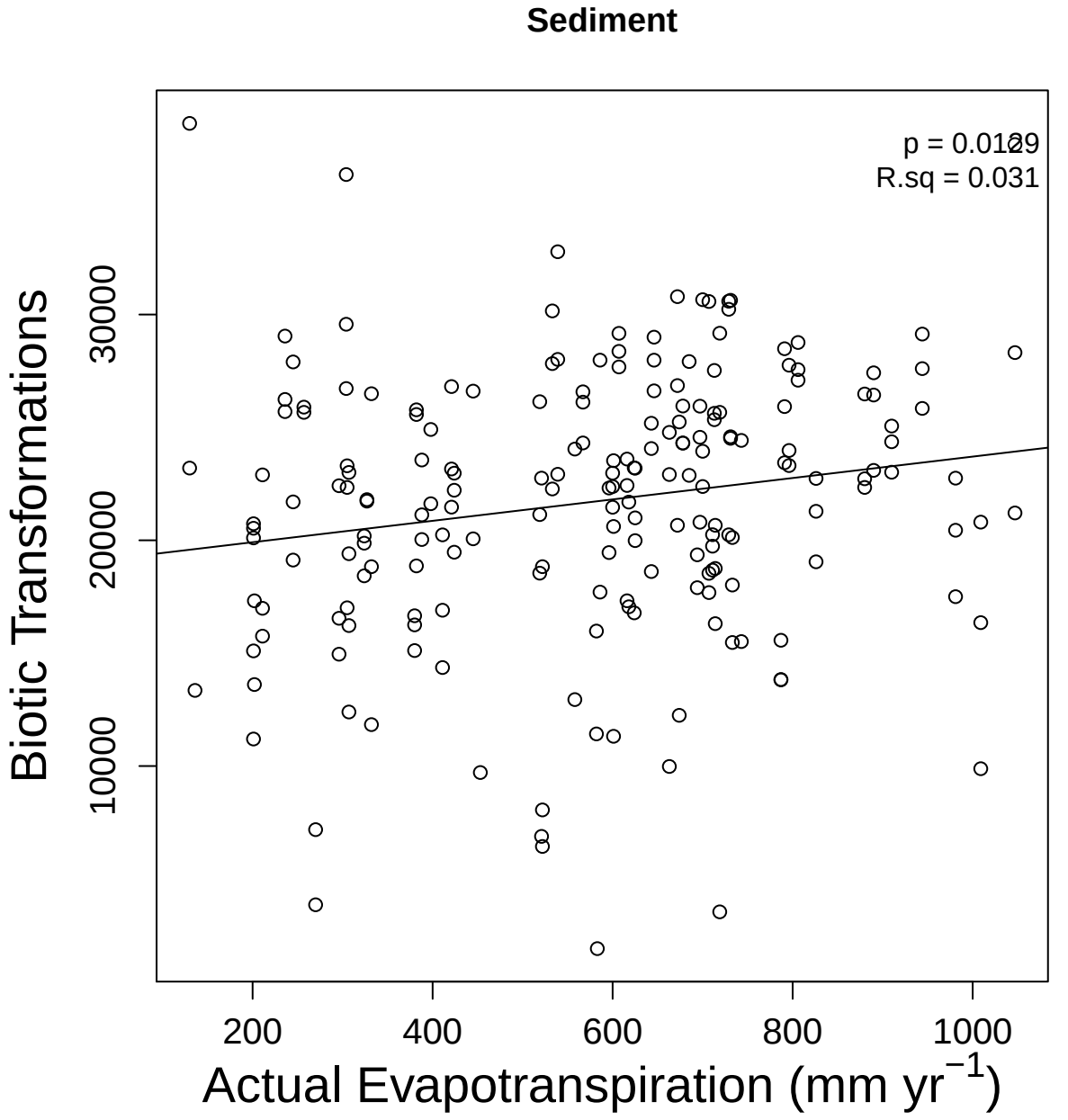

Surface Water
p = 0
R.sq = 0.078
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

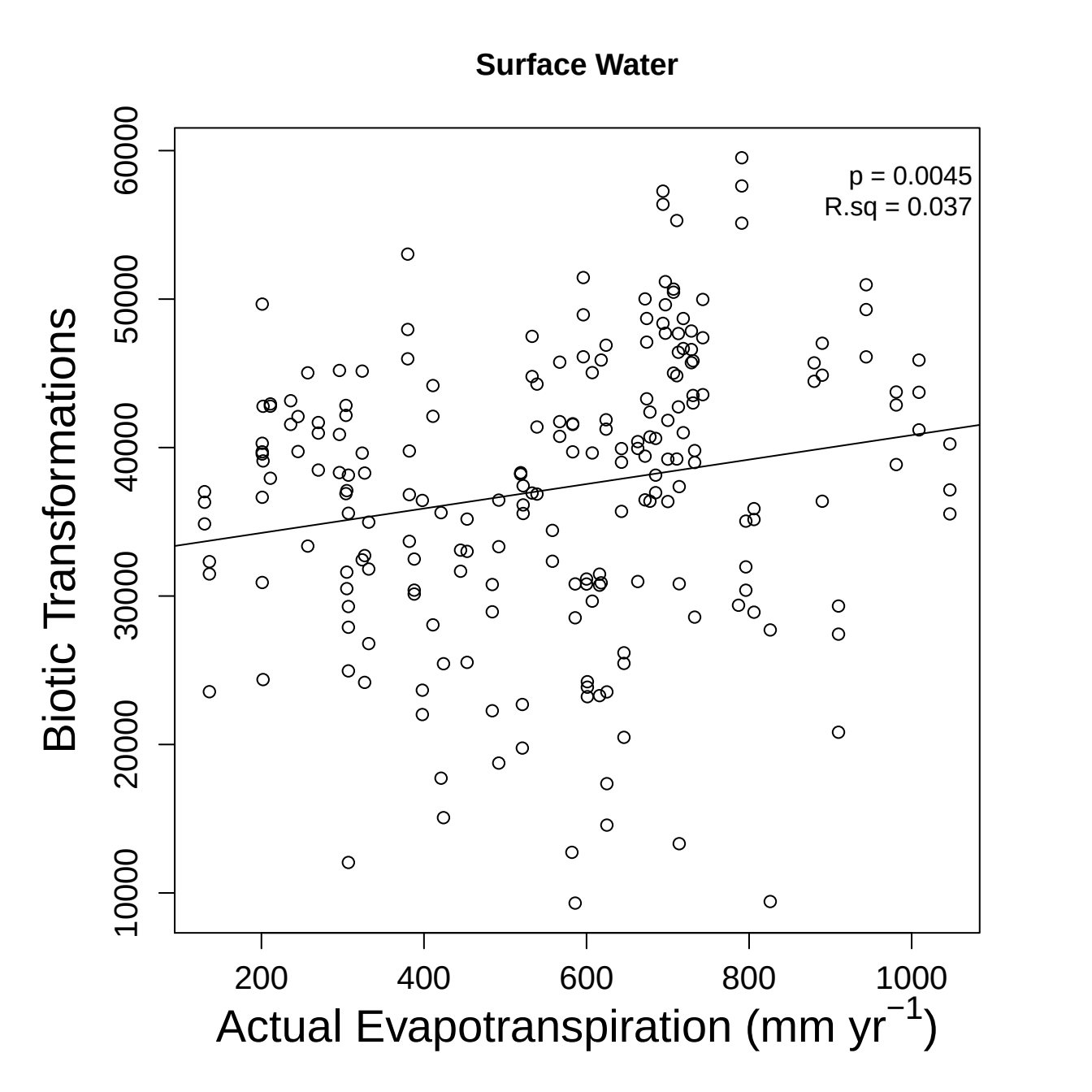

Sediment
p = 0.0609
R.sq = 0.018
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
0
5
10
15
20
25
Mean Annual Temperature (°C)

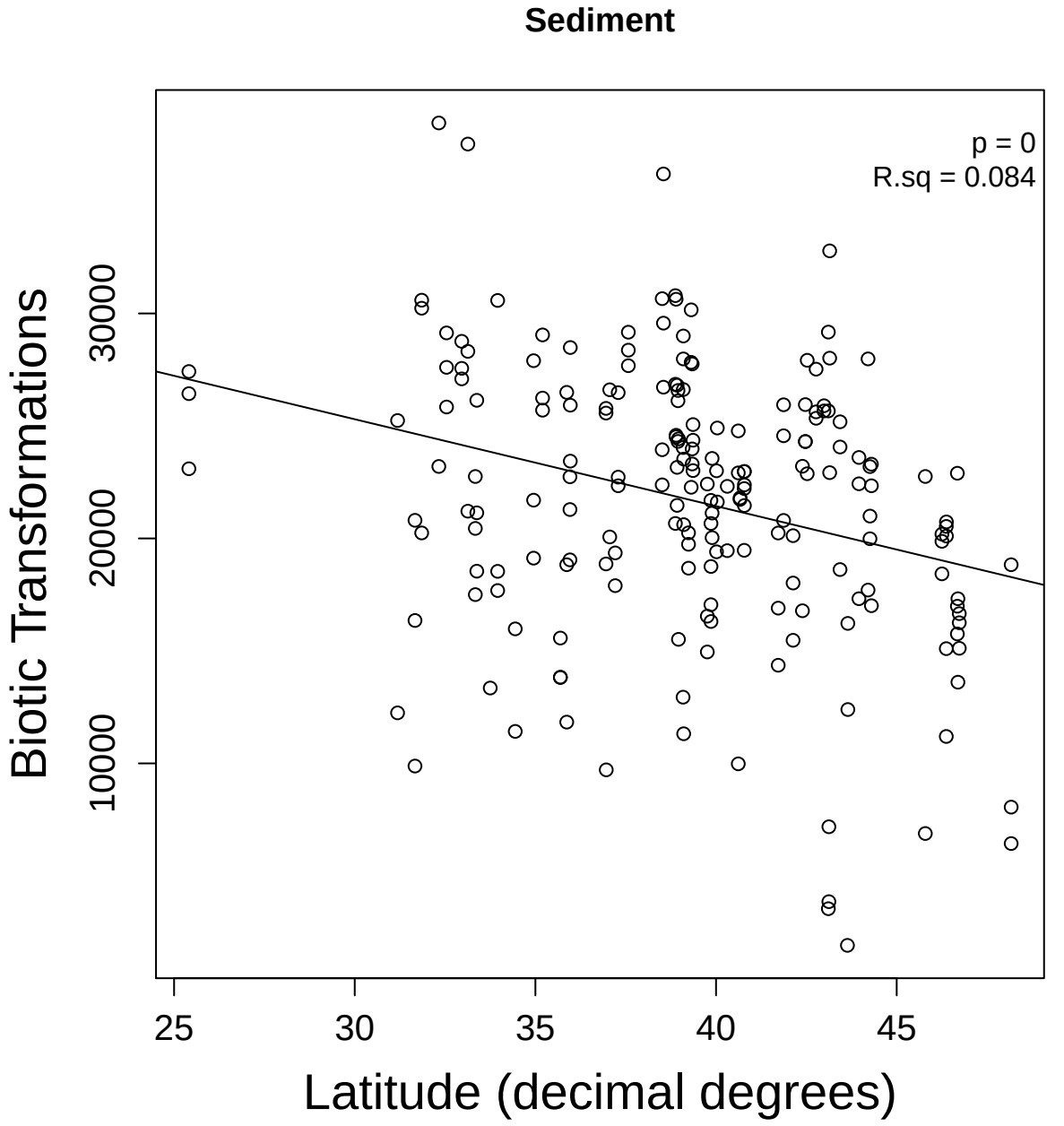

Surface Water
p = 0.8645
R.sq = 0
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
0
5
10
15
20
25
Mean Annual Temperature (°C)

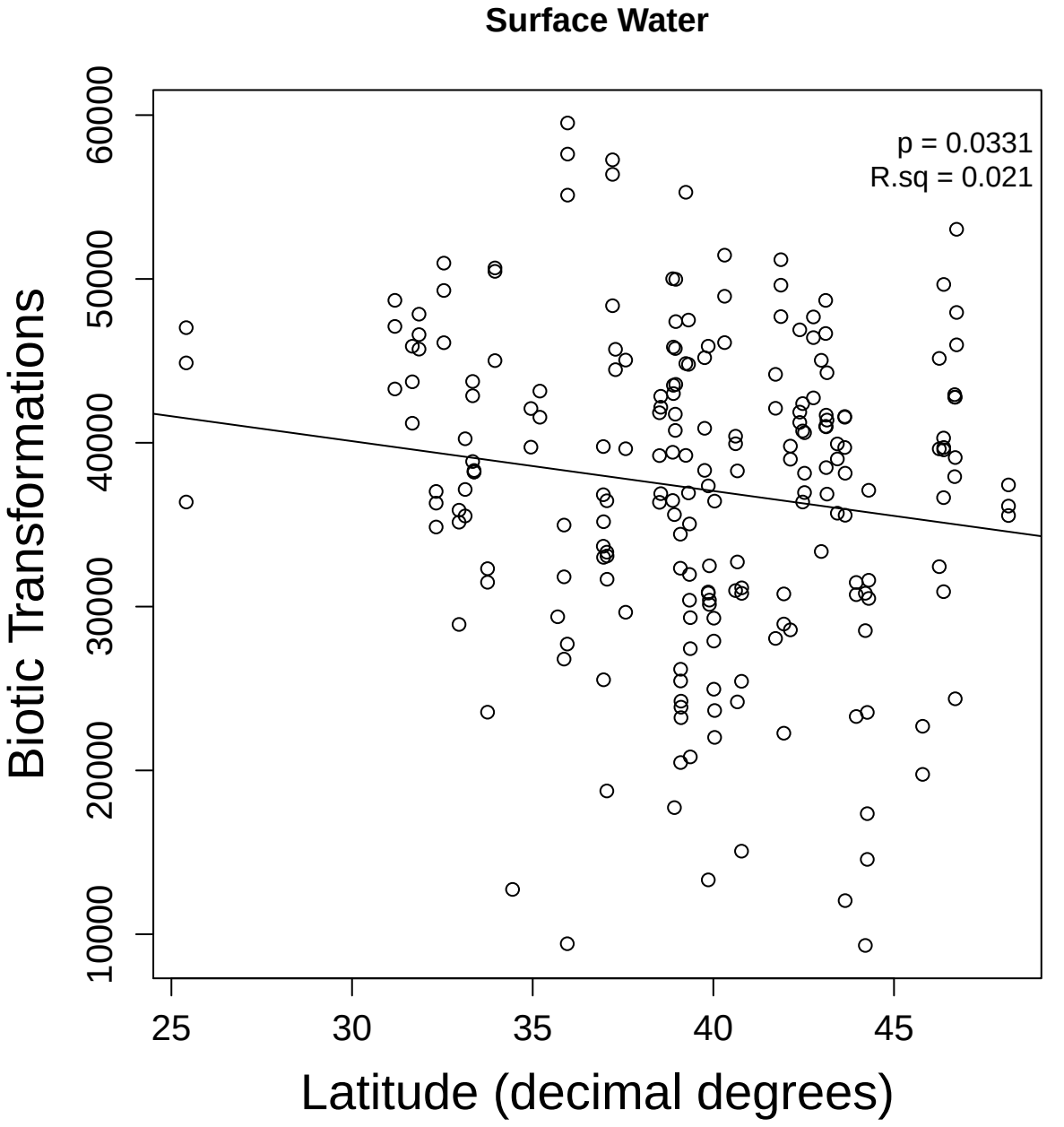

Sediment
p = 0.505
R.sq = 0.002
Abiotic to Biotic Ratio
0.010
0.011
0.012
0.013
0.014
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

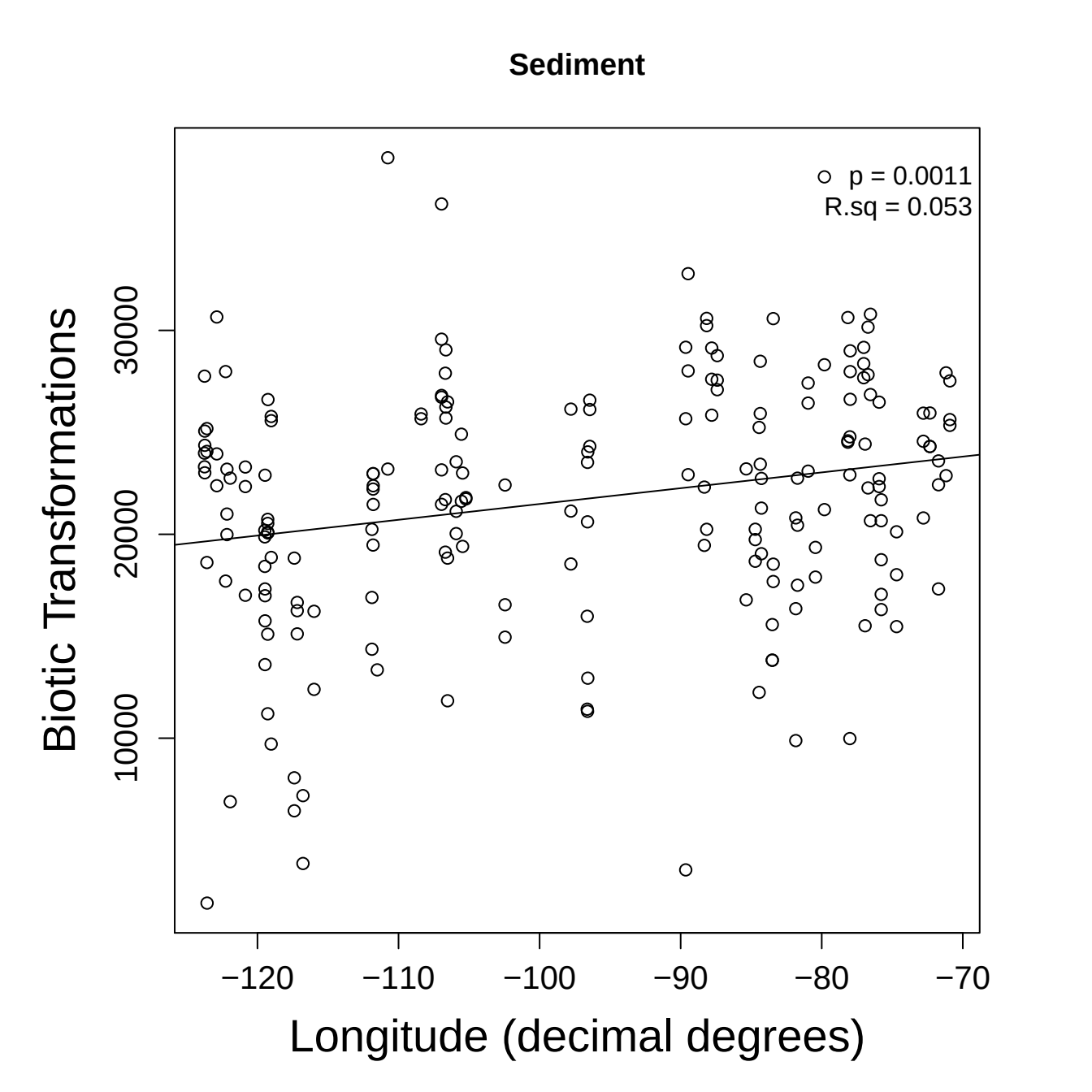

Surface Water
p = 3e−04
R.sq = 0.059
Abiotic to Biotic Ratio
0.009
0.010
0.011
0.012
0.013
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

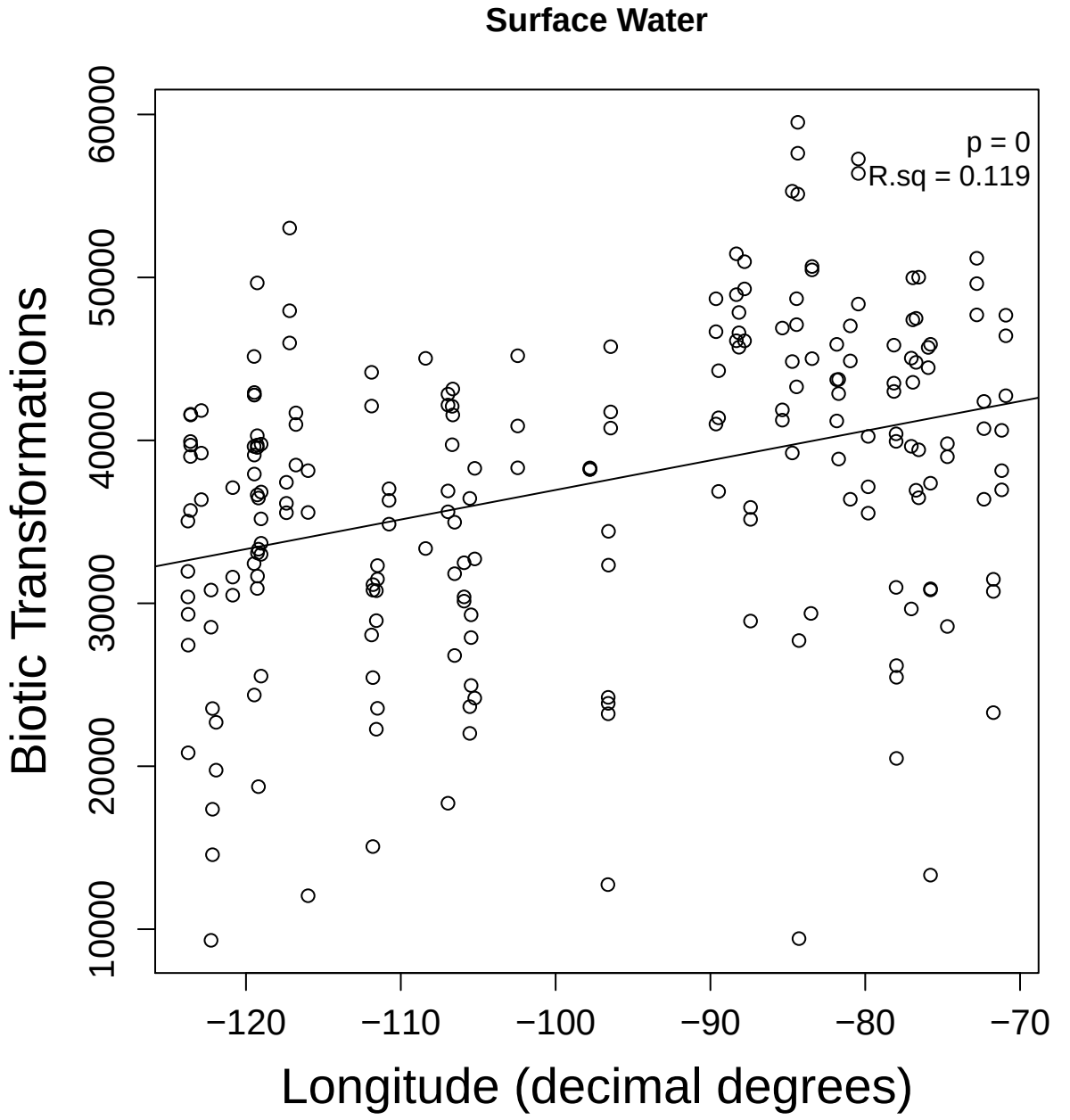

Sediment
p = 0.0129
R.sq = 0.031
Biotic Transformations
10000
20000
30000
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

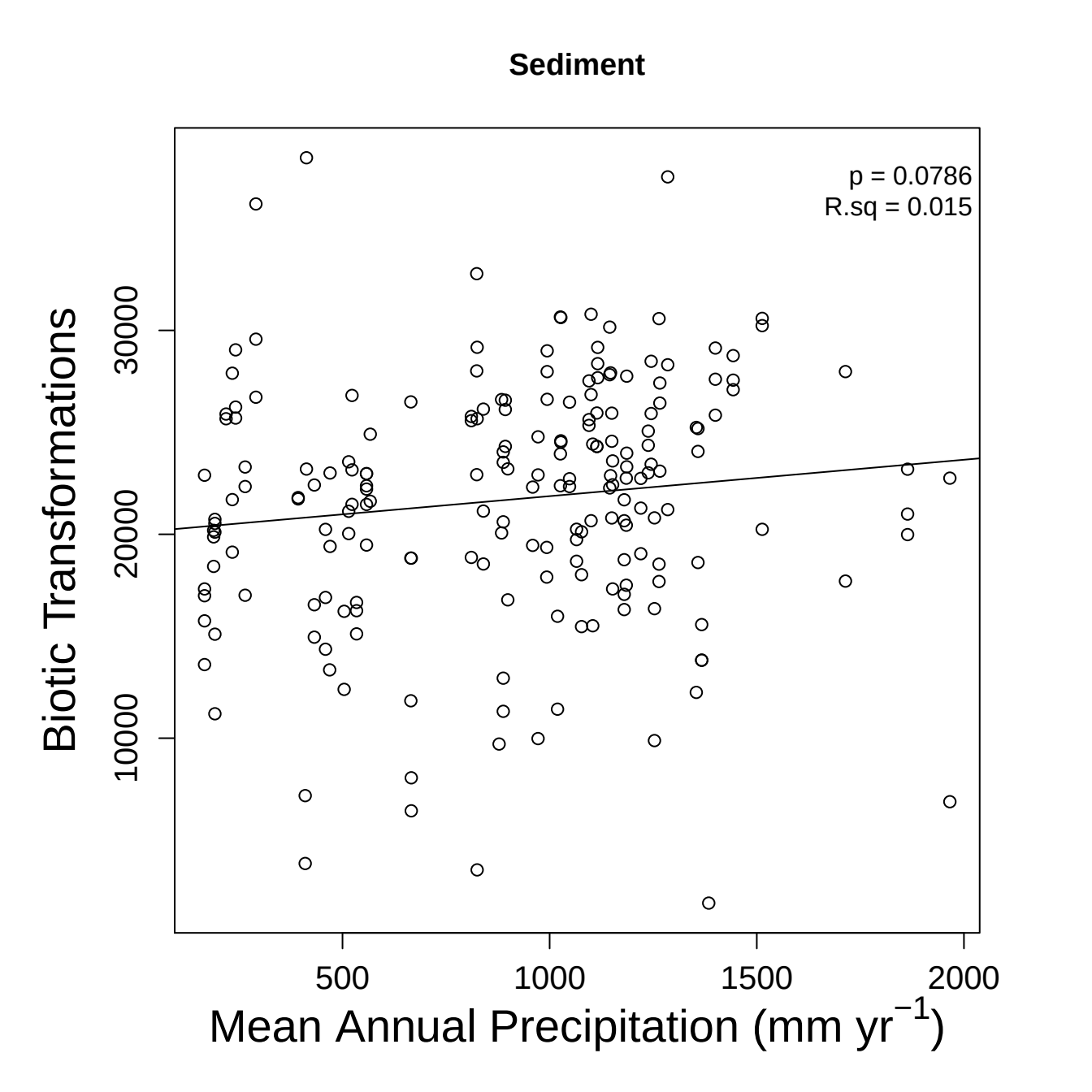

Surface Water
p = 0.0045
R.sq = 0.037
Biotic Transformations
10000
20000
30000
40000
50000
60000
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

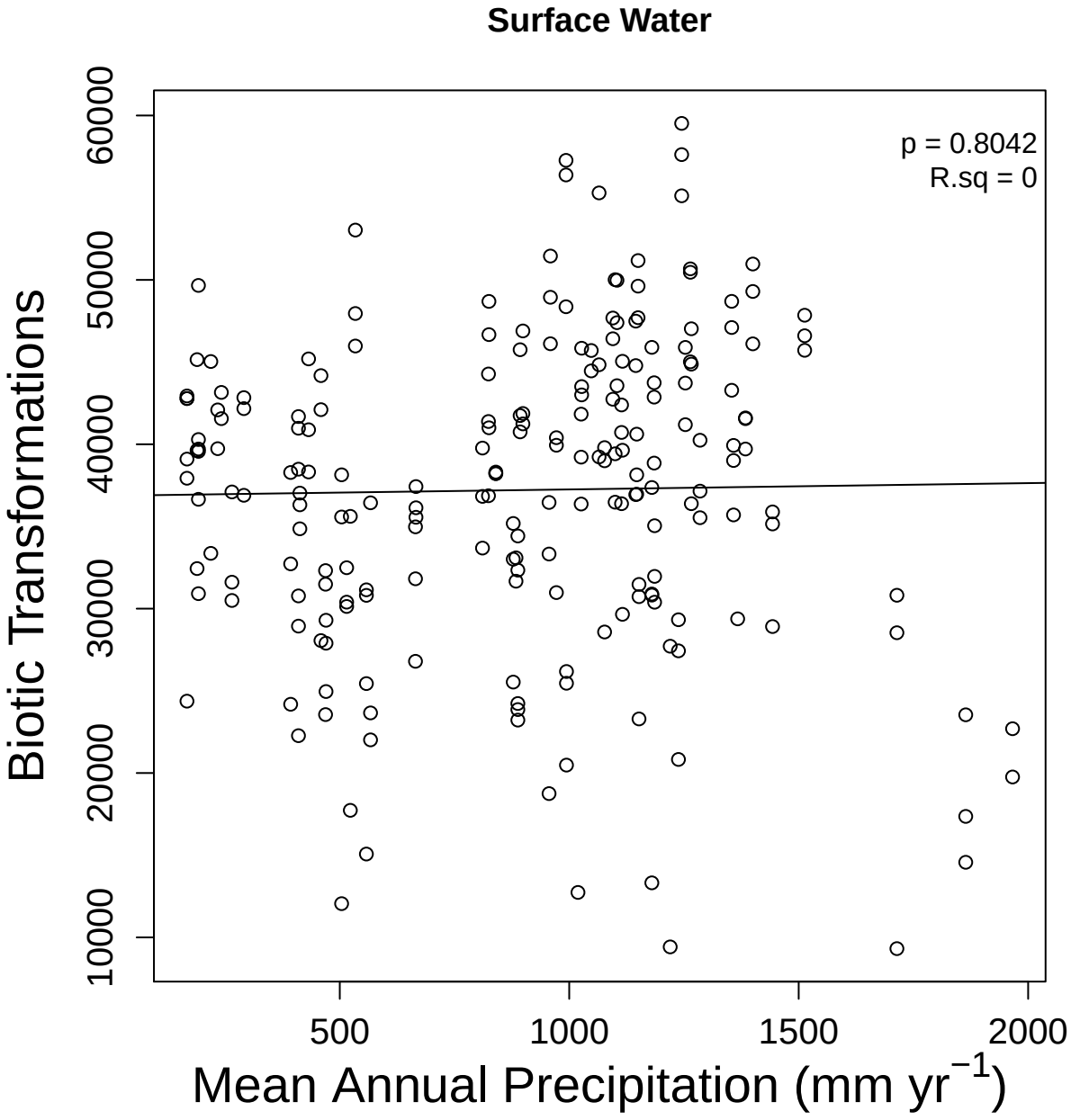

Sediment
p = 0
R.sq = 0.084
Biotic Transformations
10000
20000
30000
25
30
35
40
45
Latitude (decimal degrees)

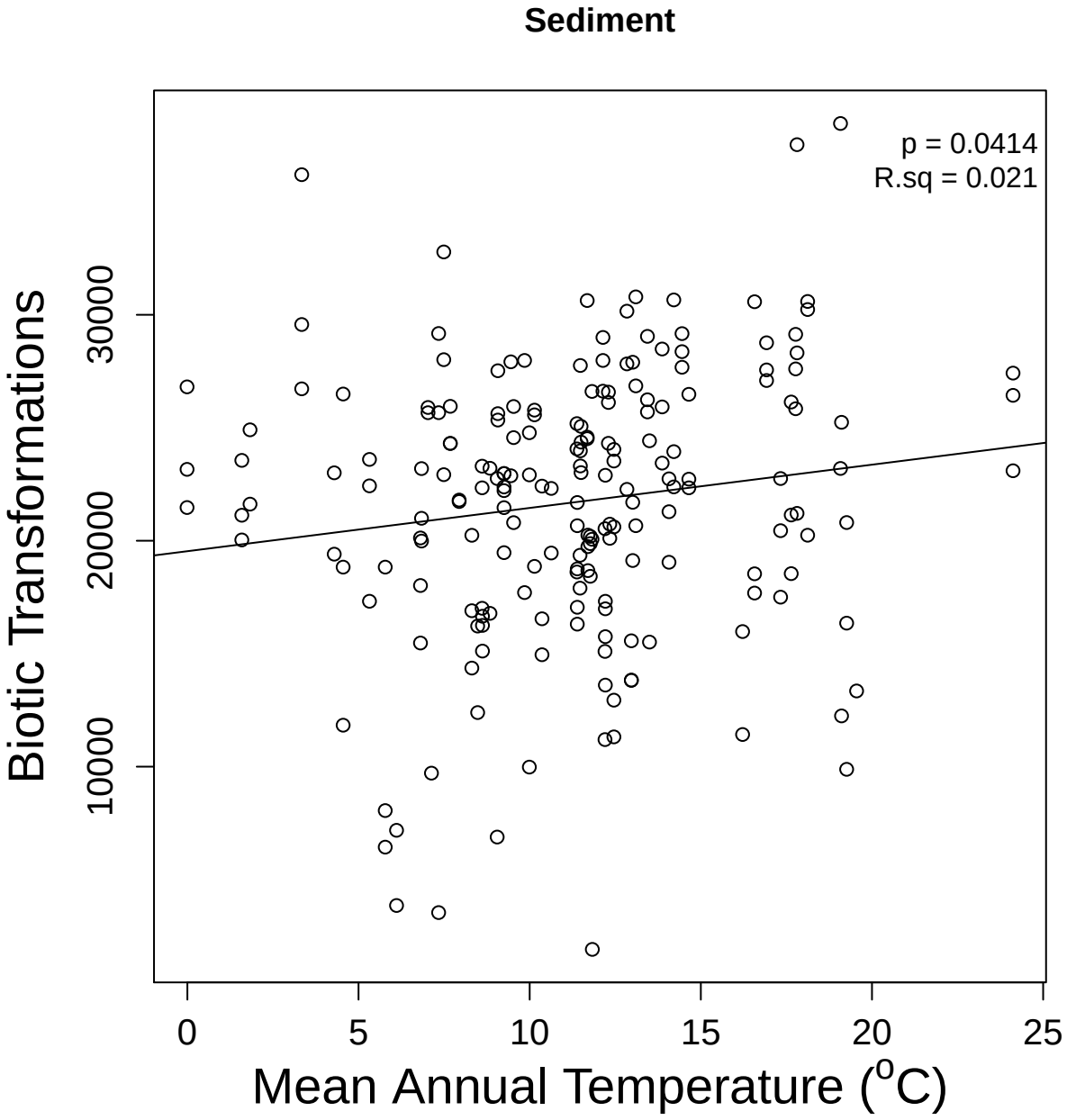

Surface Water
p = 0.0331
R.sq = 0.021
Biotic Transformations
10000
20000
30000
40000
50000
60000
25
30
35
40
45
Latitude (decimal degrees)

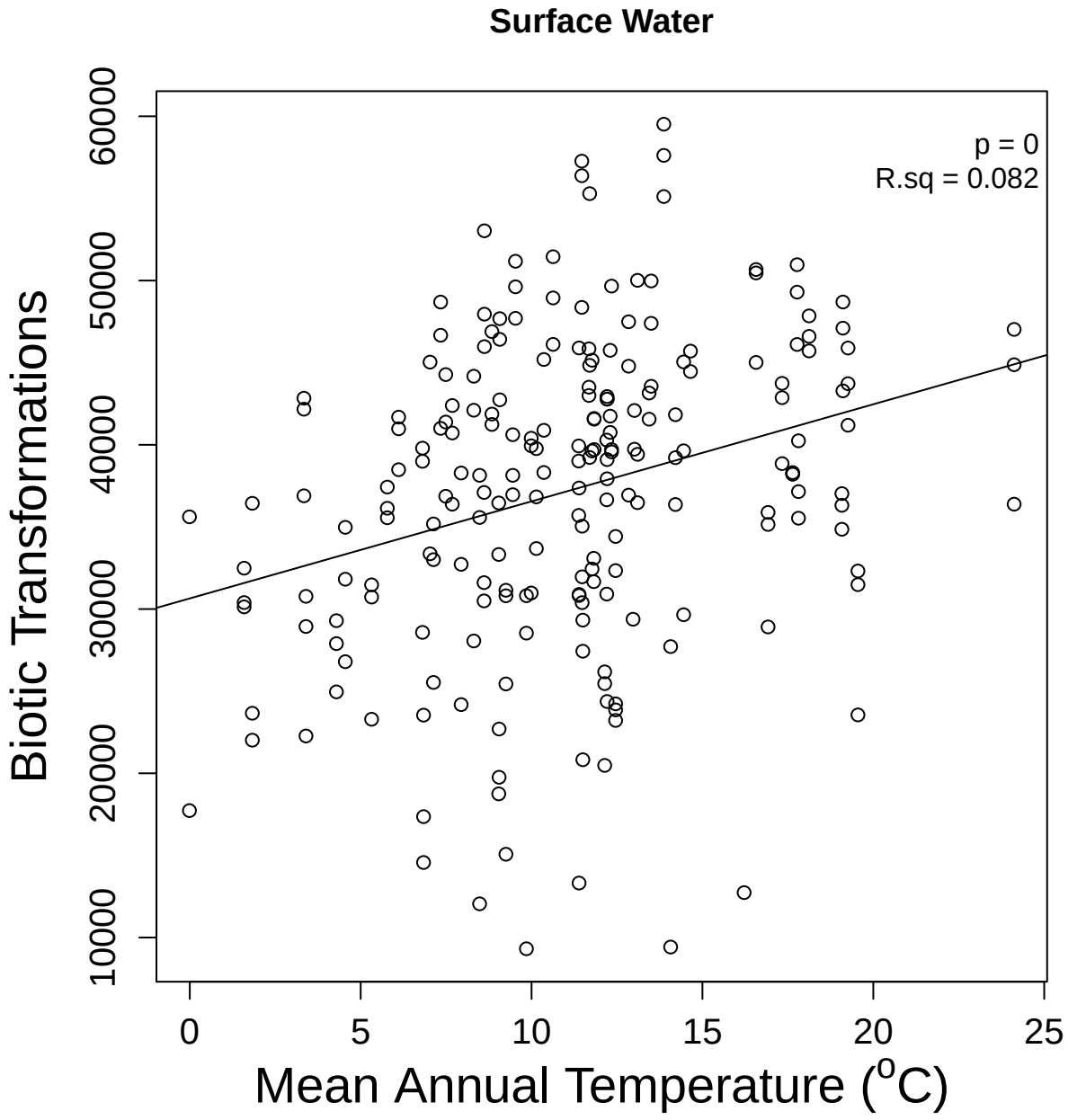

Sediment
p = 0.0011
R.sq = 0.053
Biotic Transformations
10000
20000
30000
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

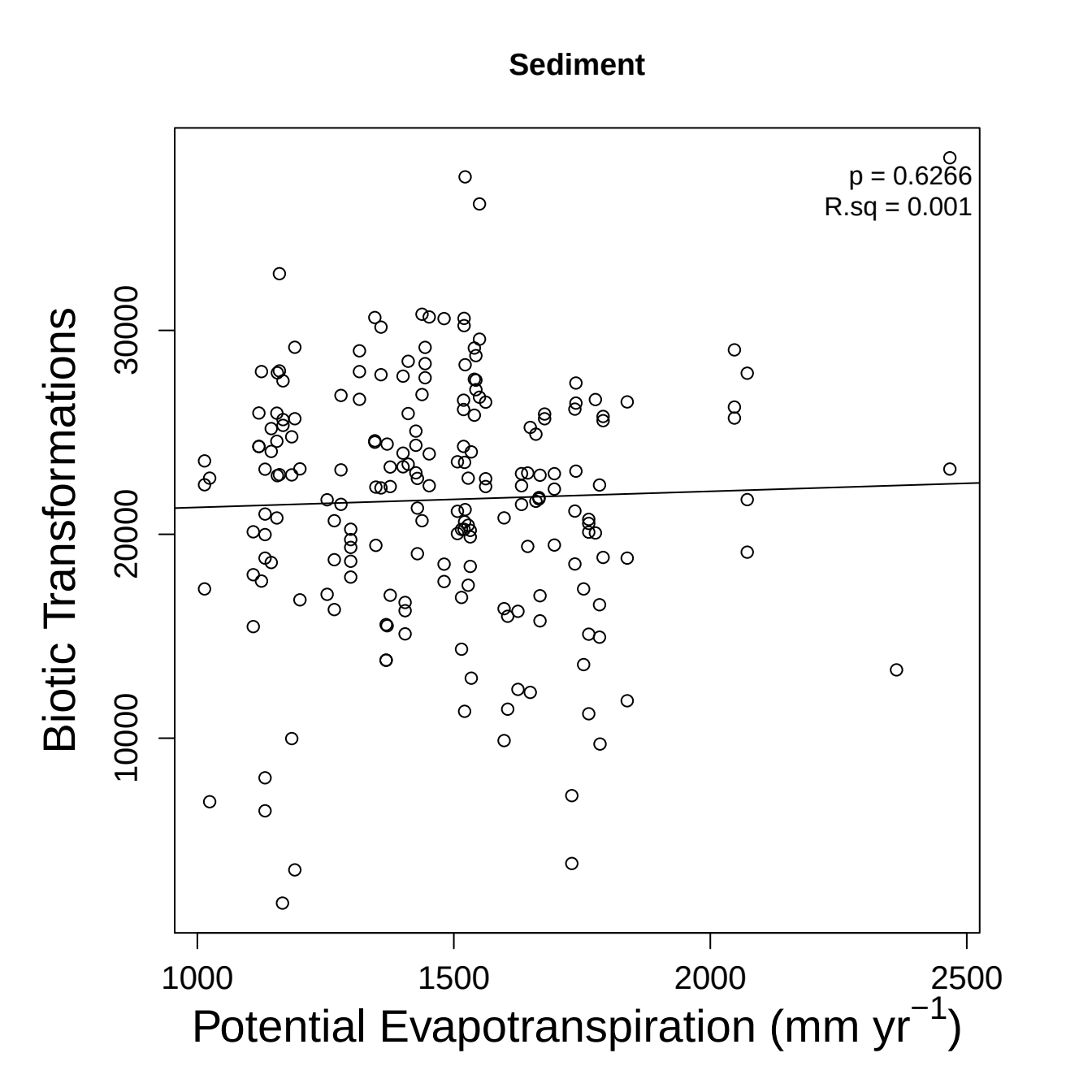

Surface Water
p = 0
R.sq = 0.119
Biotic Transformations
10000
20000
30000
40000
50000
60000
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

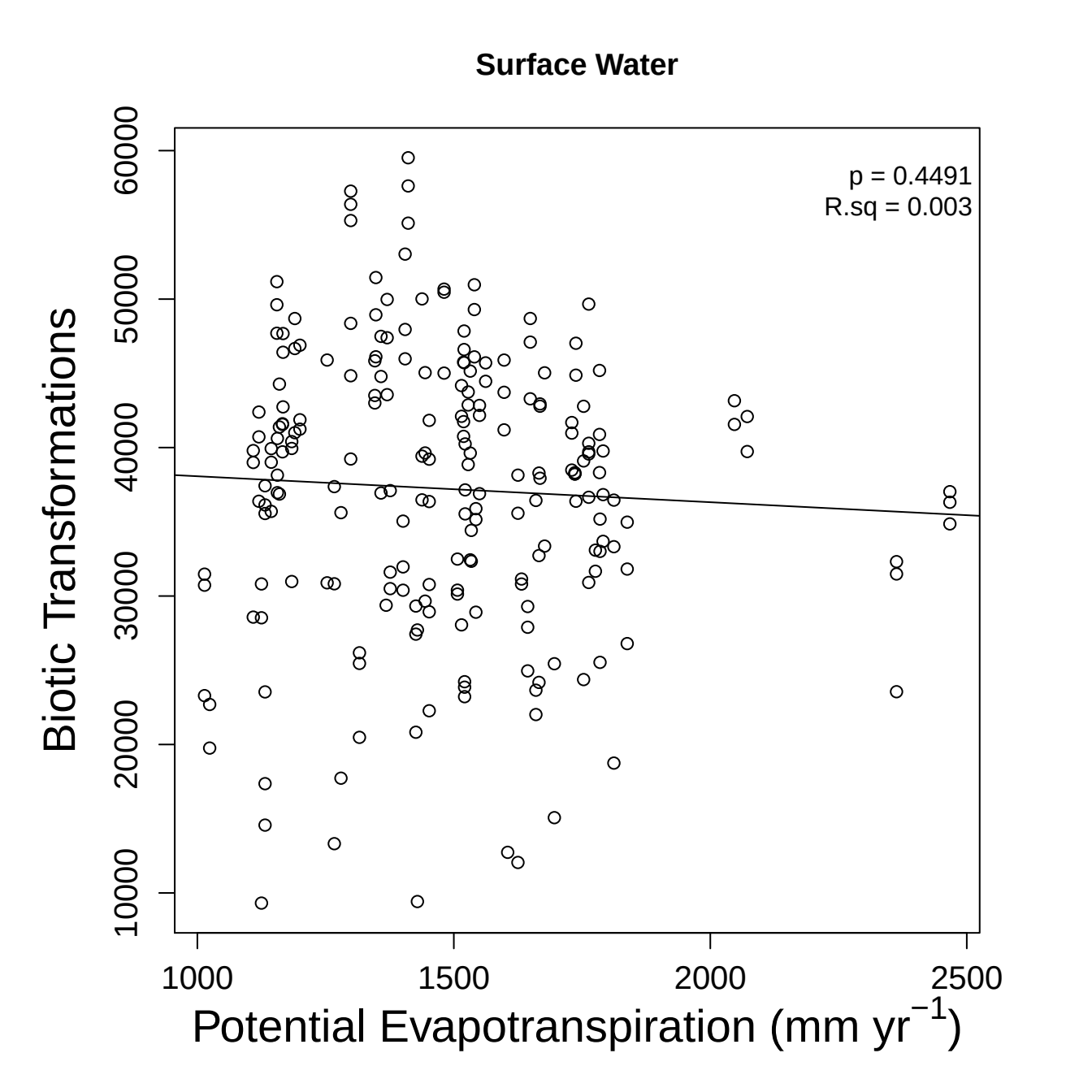

Sediment
p = 0.0786
R.sq = 0.015
Biotic Transformations
10000
20000
30000
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

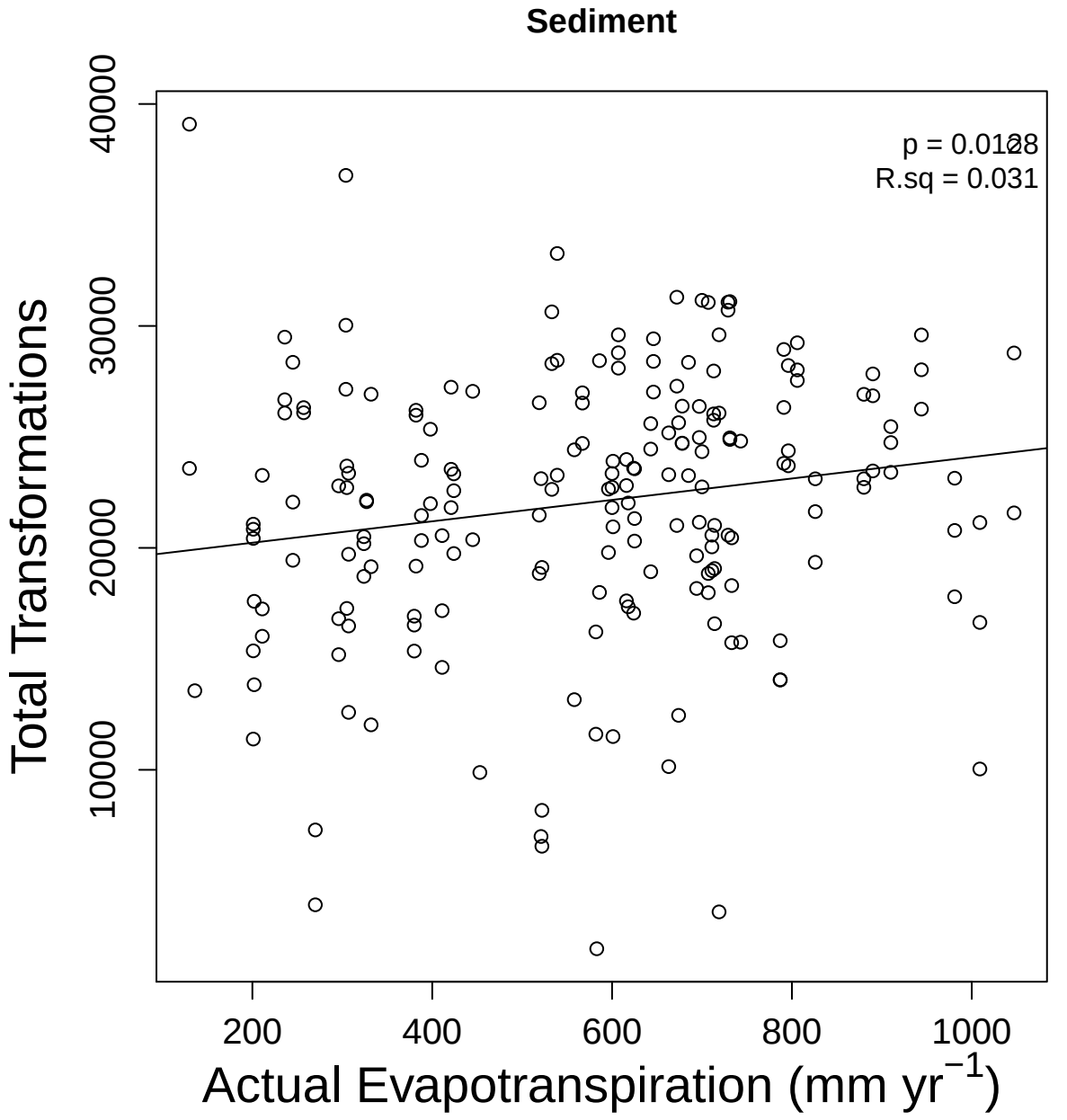

Surface Water
p = 0.8042
R.sq = 0
Biotic Transformations
10000
20000
30000
40000
50000
60000
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})

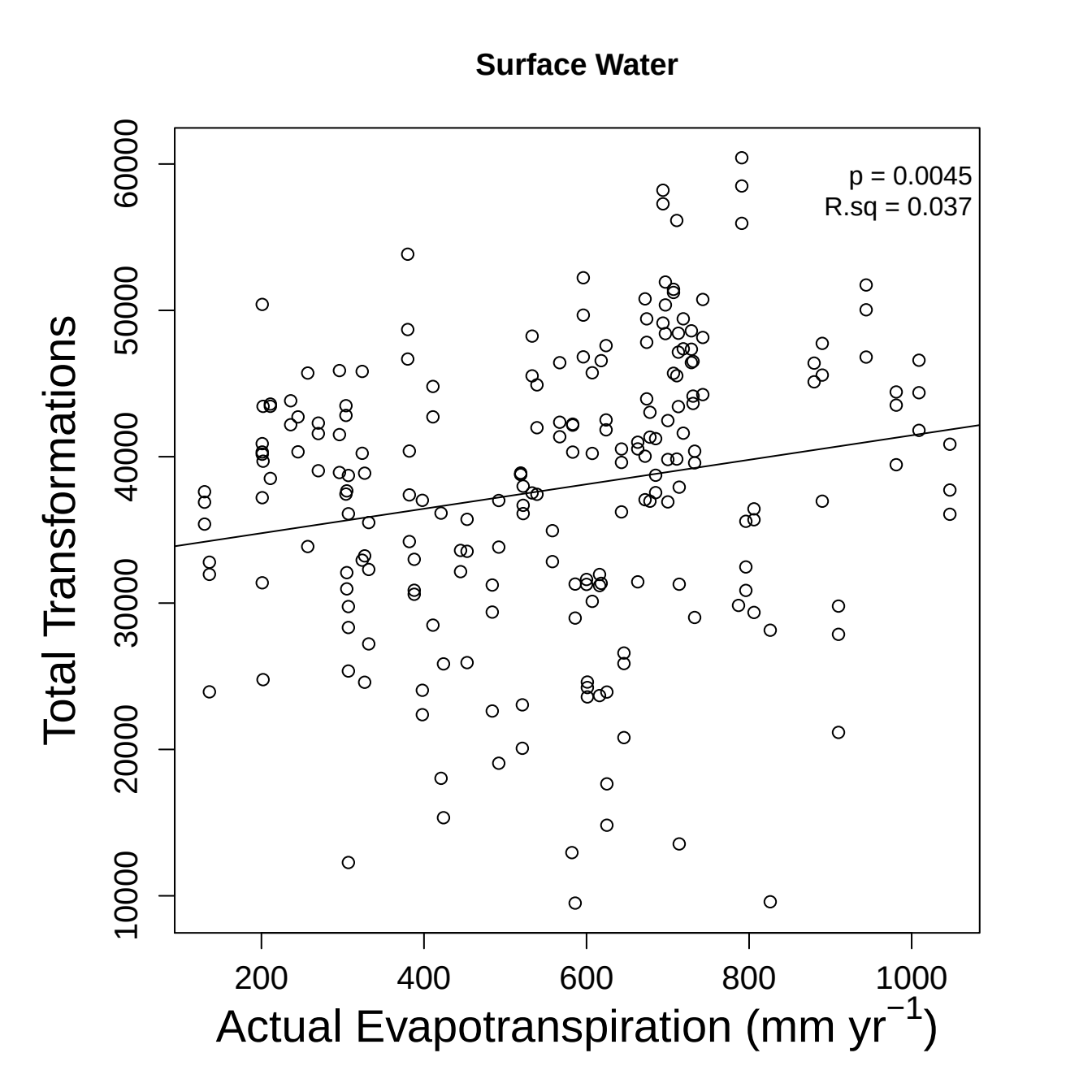

Sediment
p = 0.0414
R.sq = 0.021
Biotic Transformations
10000
20000
30000
0
5
10
15
20
25
Mean Annual Temperature (°C)

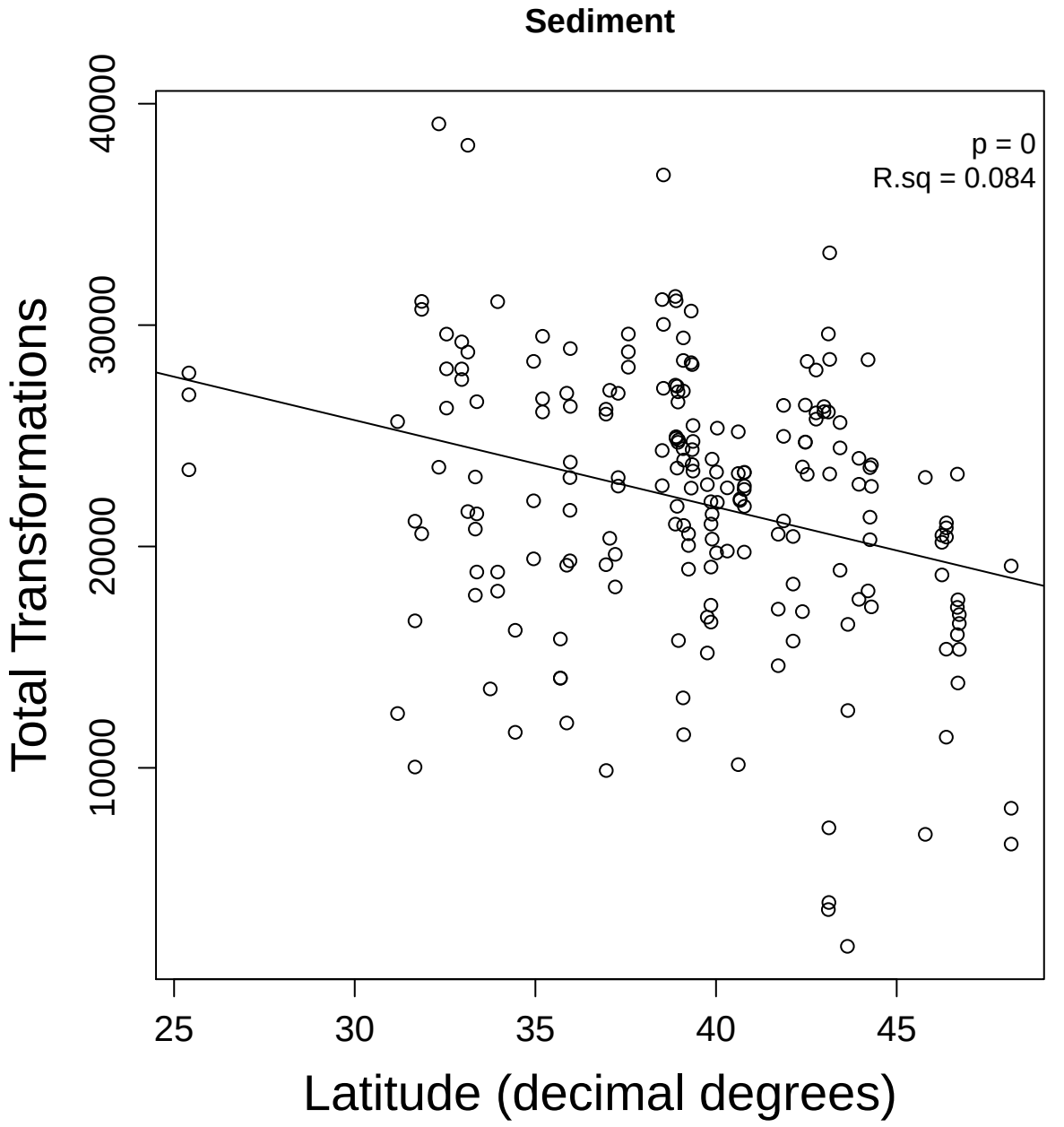

Surface Water
p = 0
R.sq = 0.082
Biotic Transformations
10000
20000
30000
40000
50000
60000
0
5
10
15
20
25
Mean Annual Temperature (°C)

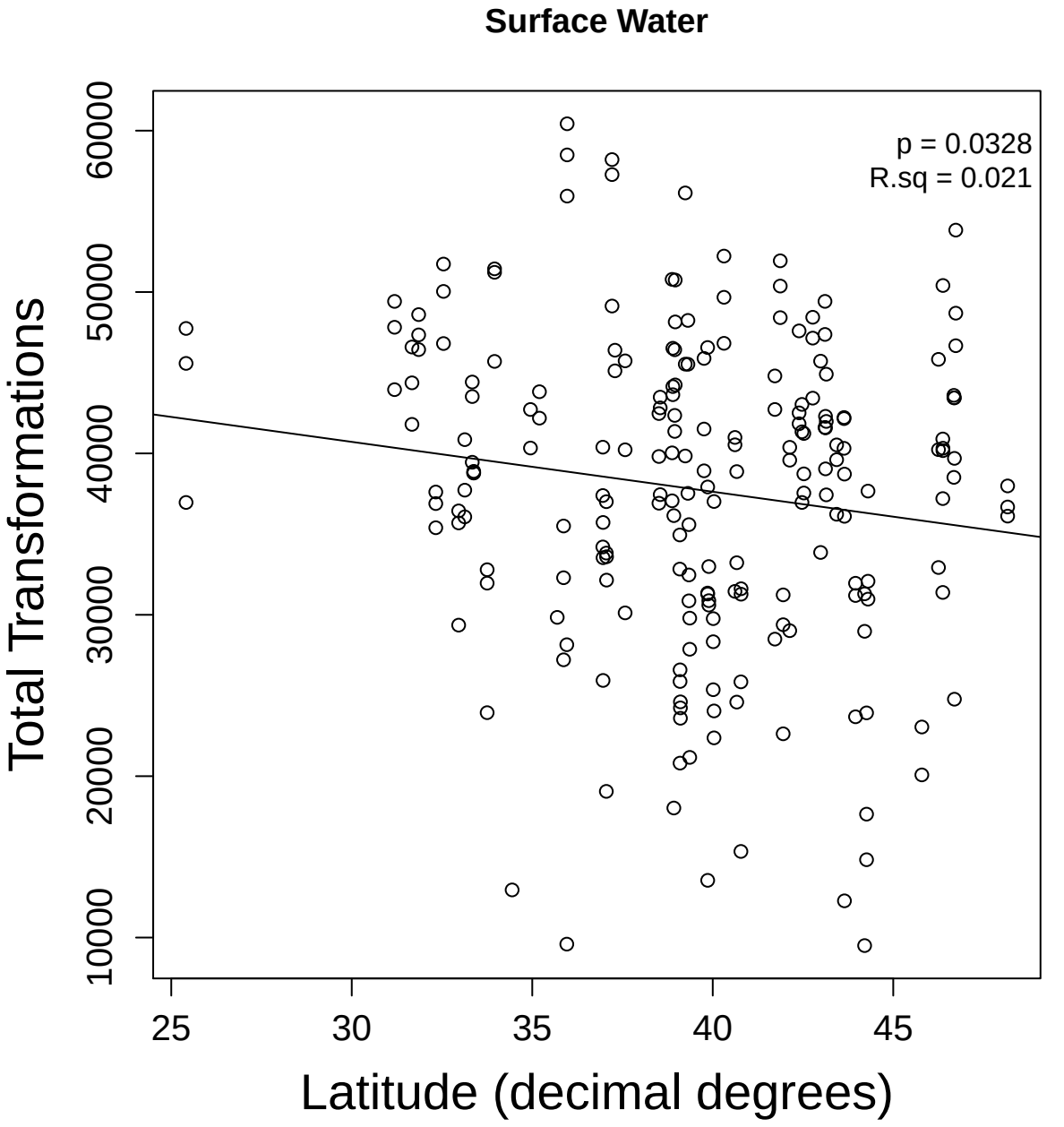

Sediment
p = 0.6266
R.sq = 0.001
Biotic Transformations
10000
20000
30000
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

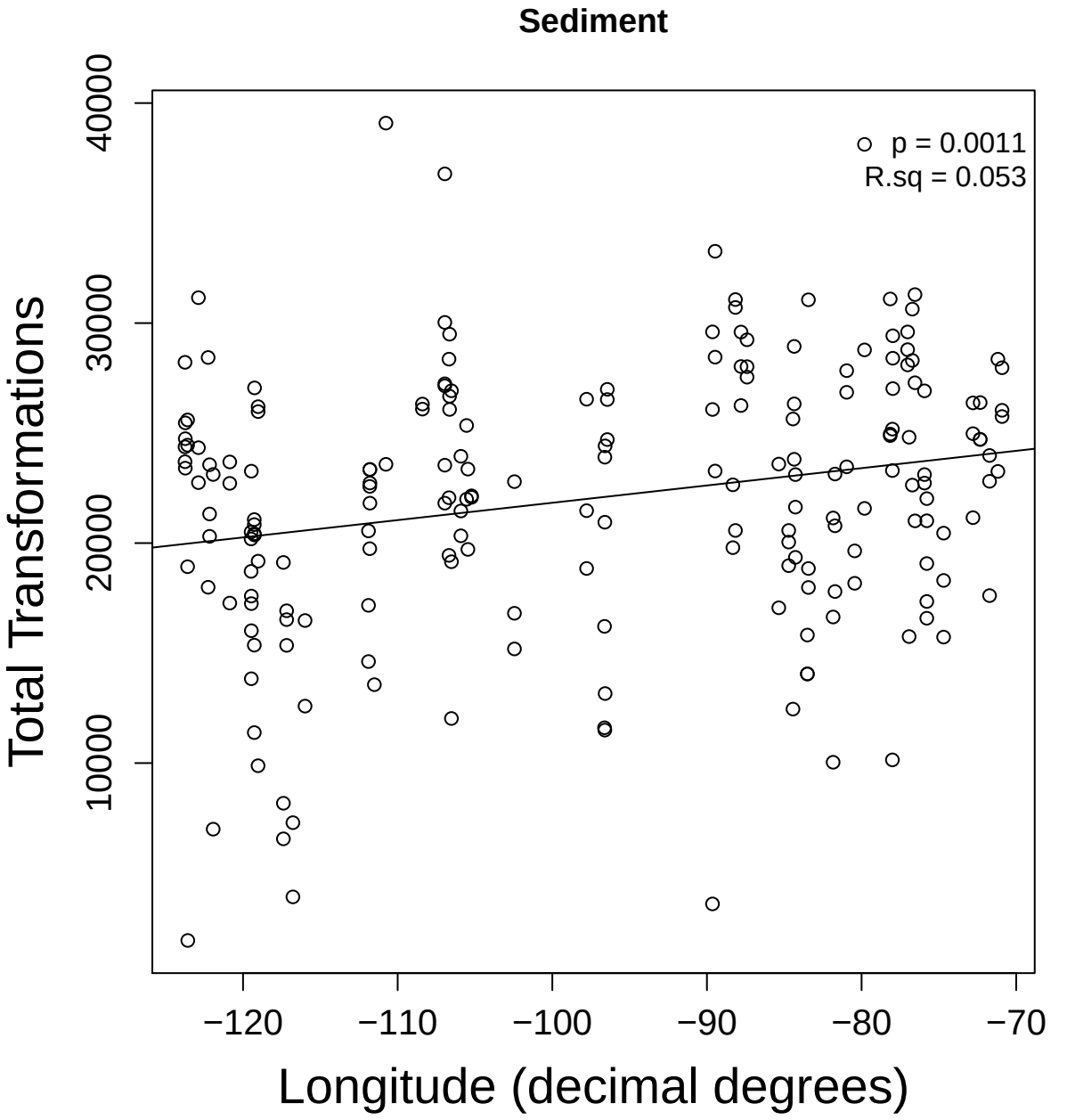

Surface Water
p = 0.4491
R.sq = 0.003
Biotic Transformations
10000
20000
30000
40000
50000
60000
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})

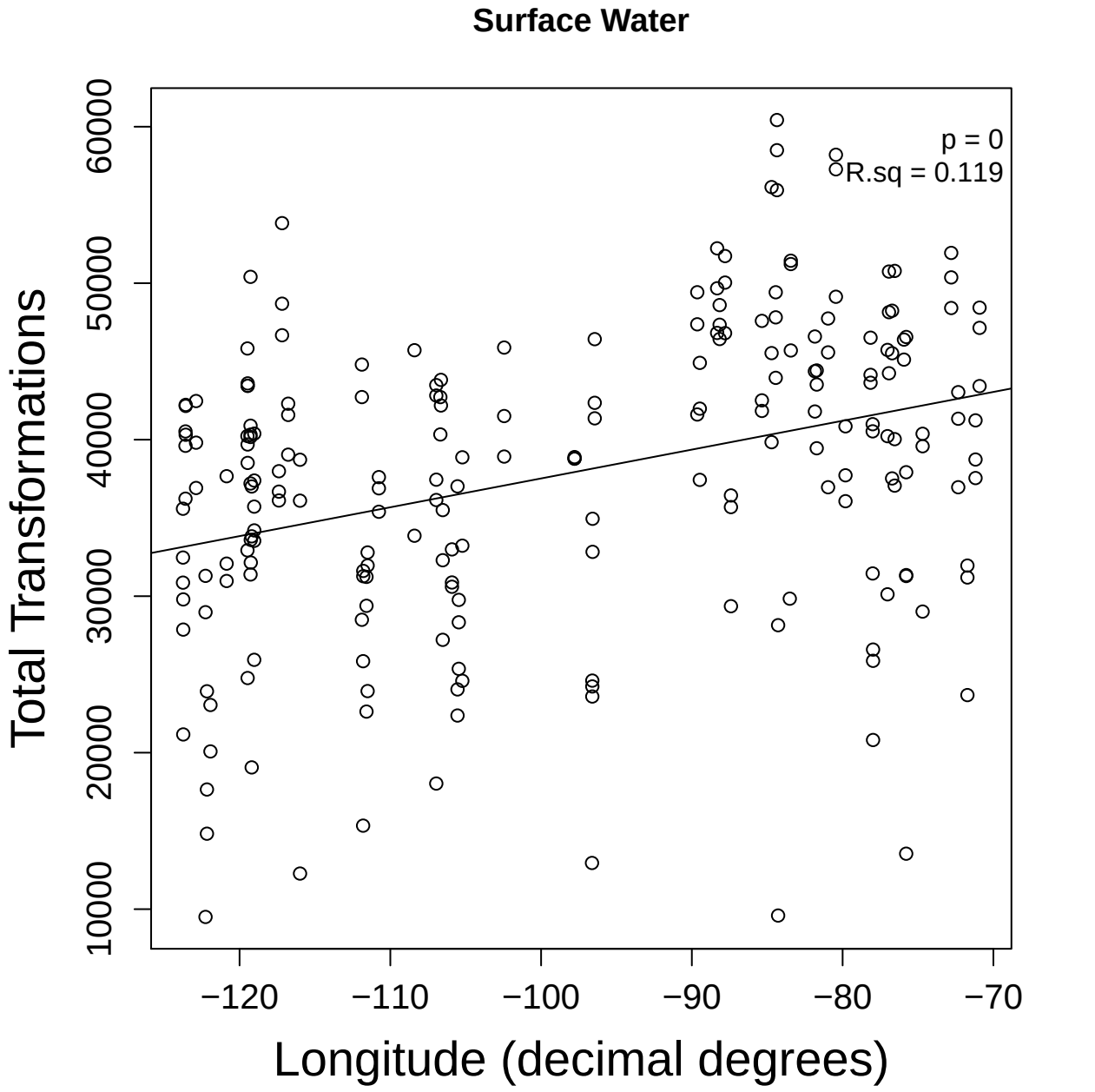

Sediment
p = 0.0128
R.sq = 0.031
Total Transformations
10000
20000
30000
40000
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

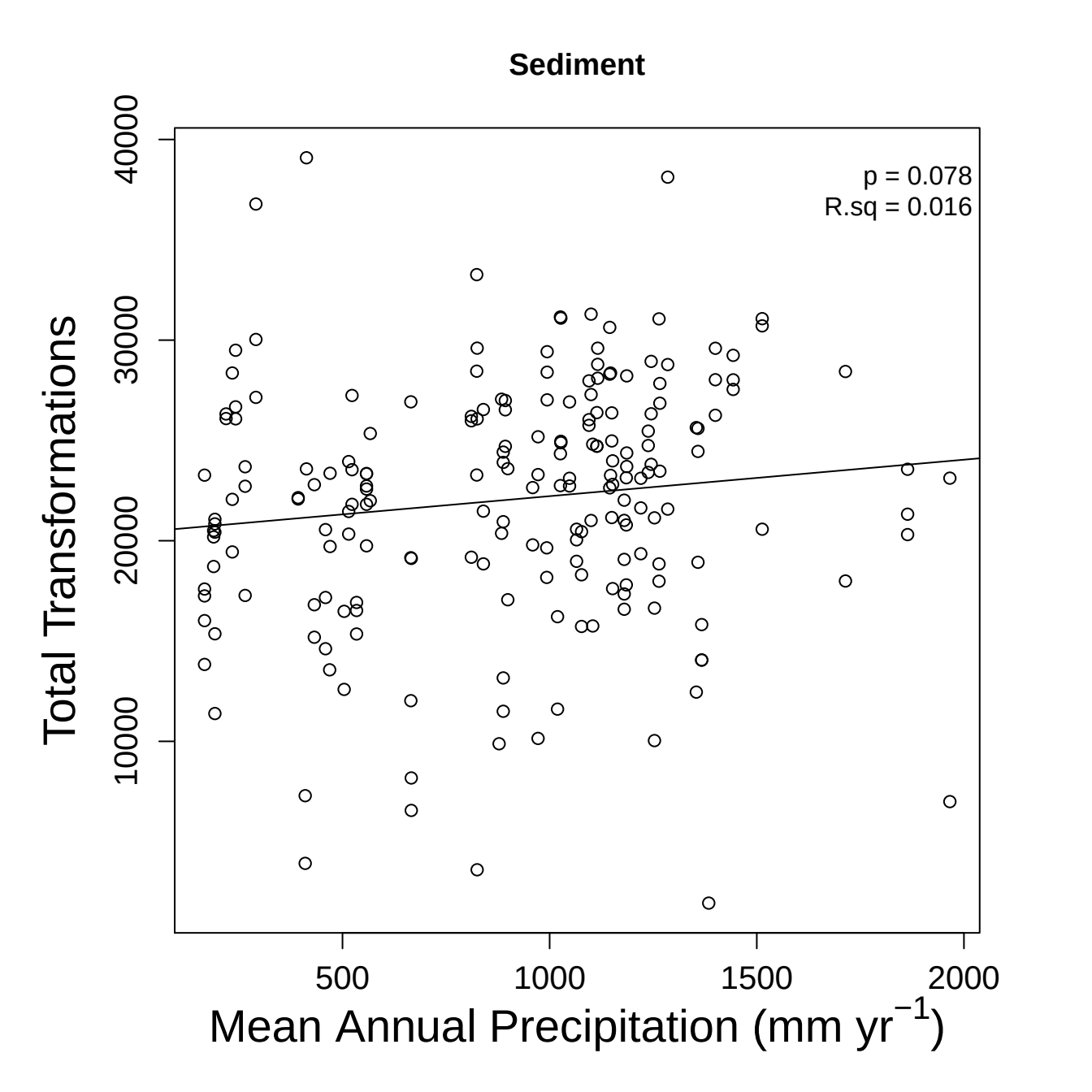

Surface Water
p = 0.0045
R.sq = 0.037
Total Transformations
10000
20000
30000
40000
50000
60000
200
400
600
800
1000
Actual Evapotranspiration (mm yr^{-1})

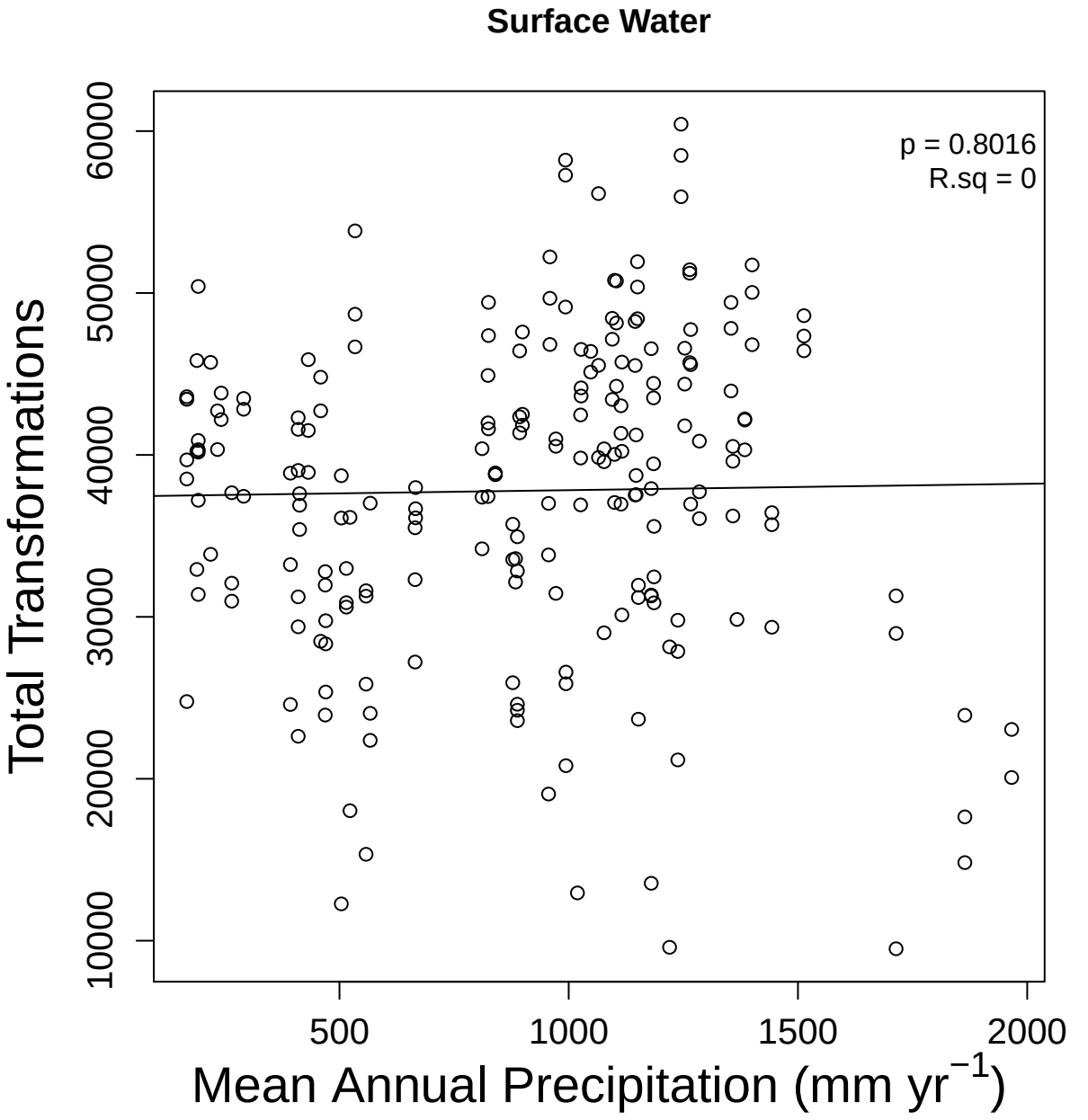

Sediment
p = 0
R.sq = 0.084
Total Transformations
10000
20000
30000
40000
25
30
35
40
45
Latitude (decimal degrees)

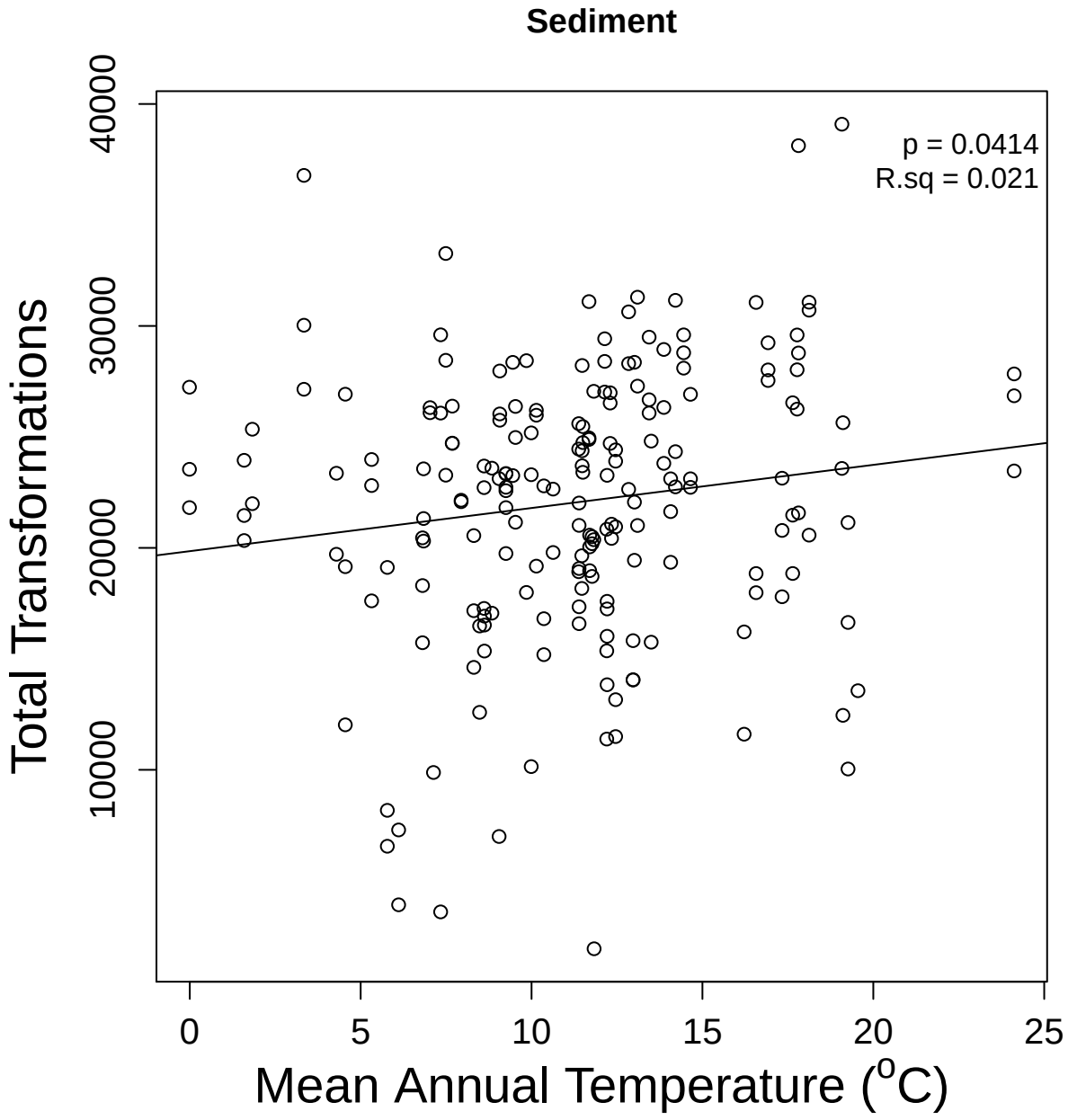

Surface Water
p = 0.0328
R.sq = 0.021
Total Transformations
10000
20000
30000
40000
50000
60000
25
30
35
40
45
Latitude (decimal degrees)

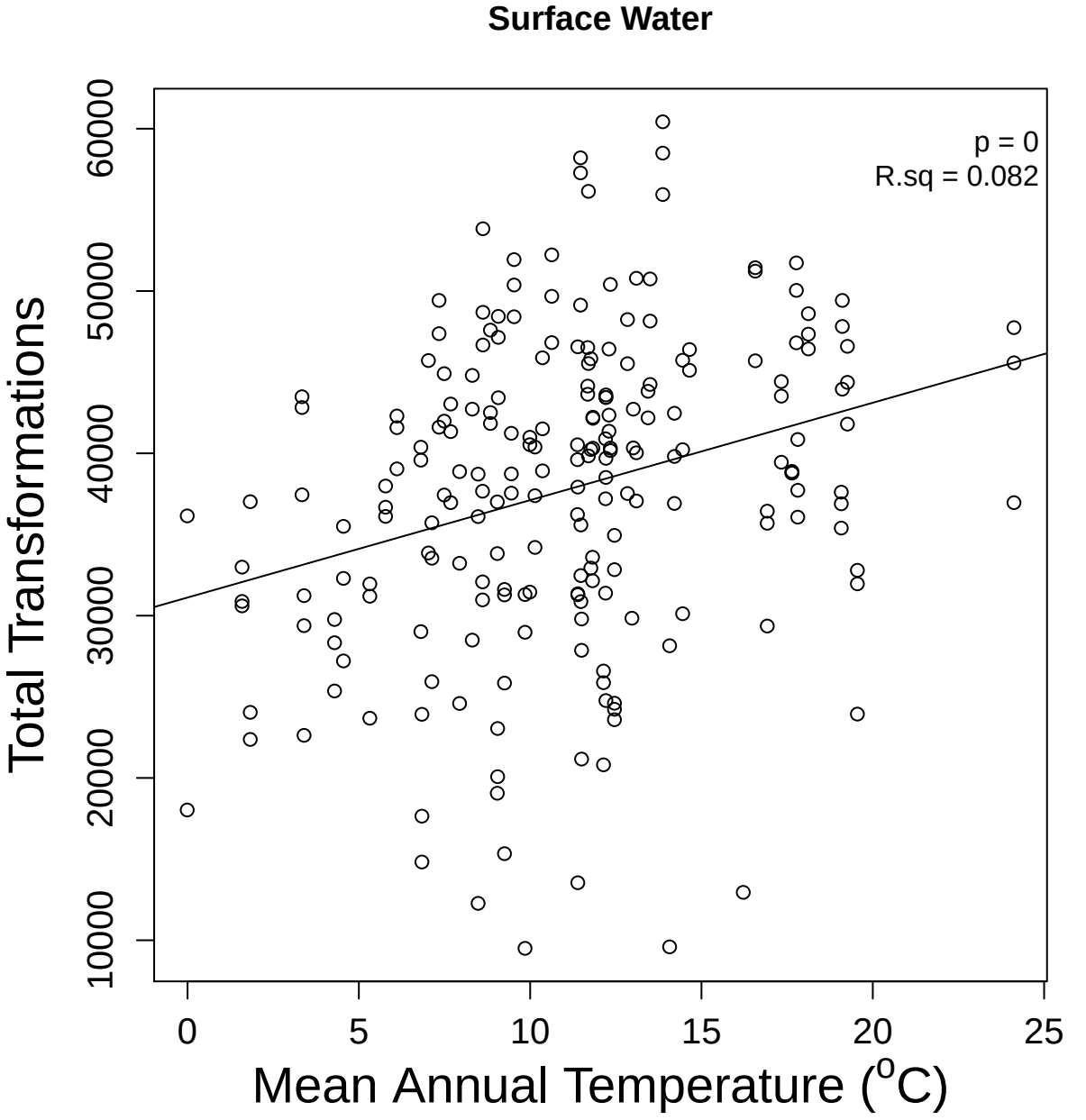

Sediment
p = 0.0011
R.sq = 0.053
Total Transformations
10000
20000
30000
40000
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

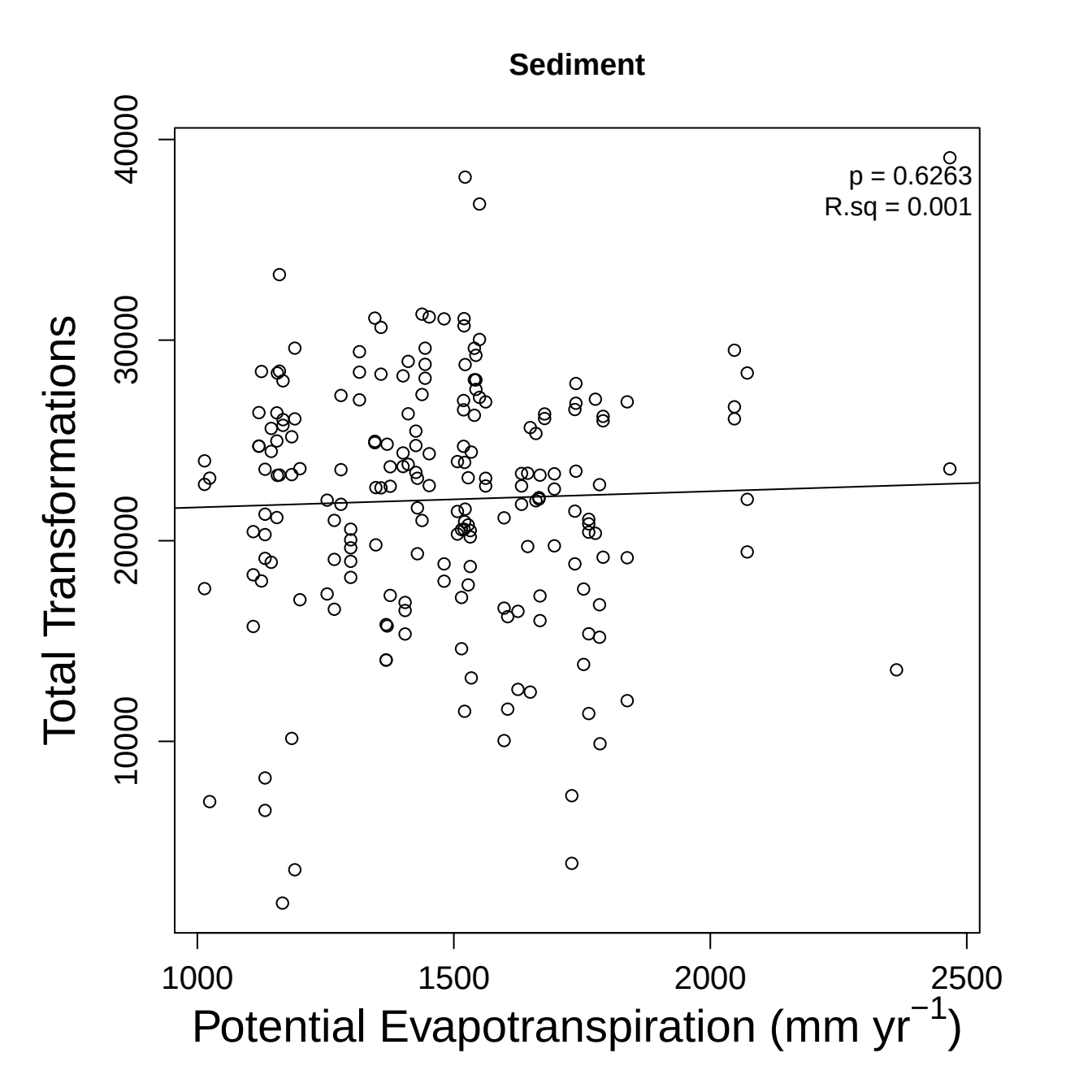

Surface Water
p = 0
R.sq = 0.119
Total Transformations
10000
20000
30000
40000
50000
60000
−120
−110
−100
−90
−80
−70
Longitude (decimal degrees)

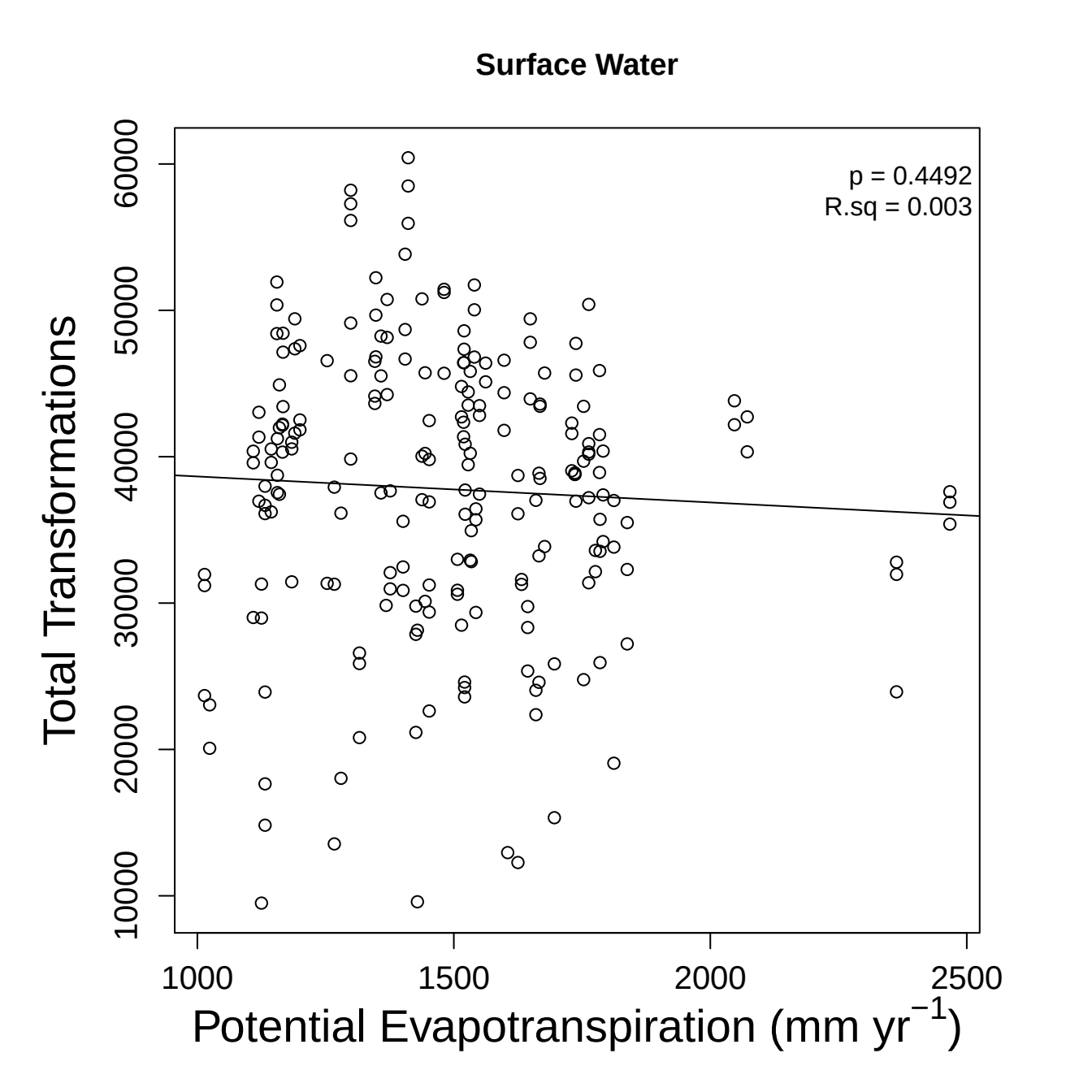

Sediment
p = 0.078
R.sq = 0.016
Total Transformations
10000
20000
30000
40000
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})


Surface Water
p = 0.8016
R.sq = 0
Total Transformations
10000
20000
30000
40000
50000
60000
500
1000
1500
2000
Mean Annual Precipitation (mm yr^{-1})


Sediment
p = 0.0414
R.sq = 0.021
Total Transformations
10000
20000
30000
40000
0
5
10
15
20
25
Mean Annual Temperature (°C)


Surface Water
p = 0
R.sq = 0.082
Total Transformations
10000
20000
30000
40000
50000
60000
0
5
10
15
20
25
Mean Annual Temperature (°C)


Sediment
p = 0.6263
R.sq = 0.001
Total Transformations
10000
20000
30000
40000
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})


Surface Water
p = 0.4492
R.sq = 0.003
Total Transformations
10000
20000
30000
40000
50000
60000
1000
1500
2000
2500
Potential Evapotranspiration (mm yr^{-1})