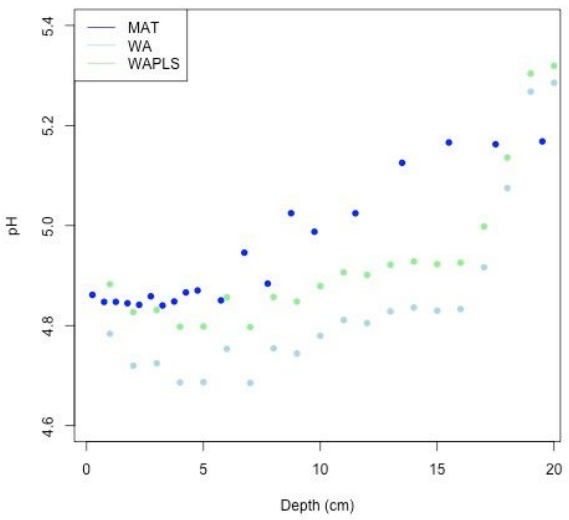
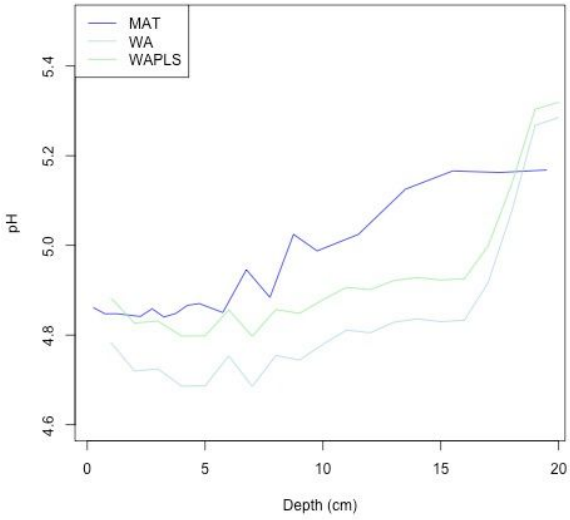
Allie Jensen
GEOG 920
Lab 10

Comparison of Transfer Functions

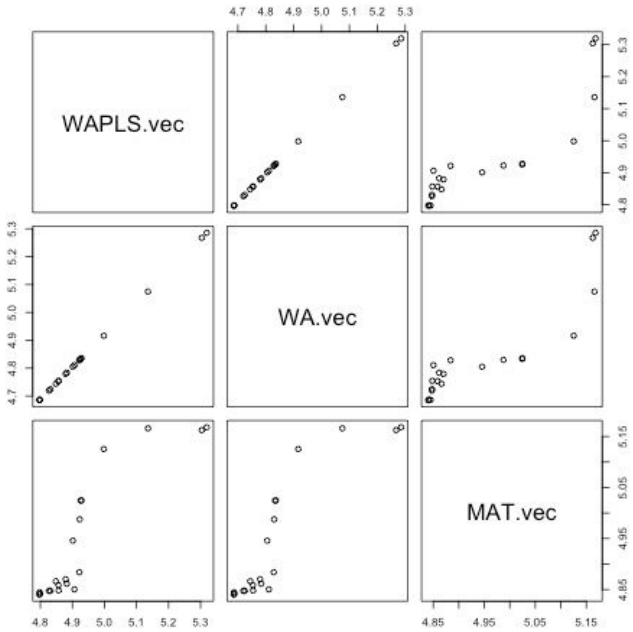
1). The appropriate WAPLS model uses 2 pls components.

2).



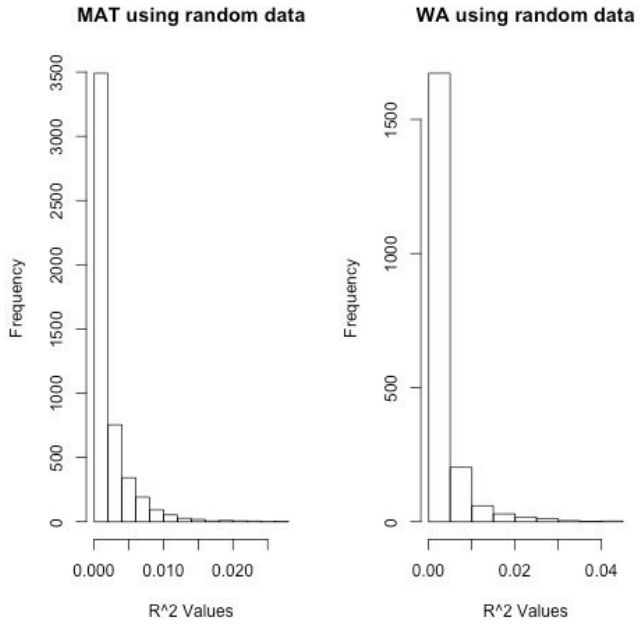


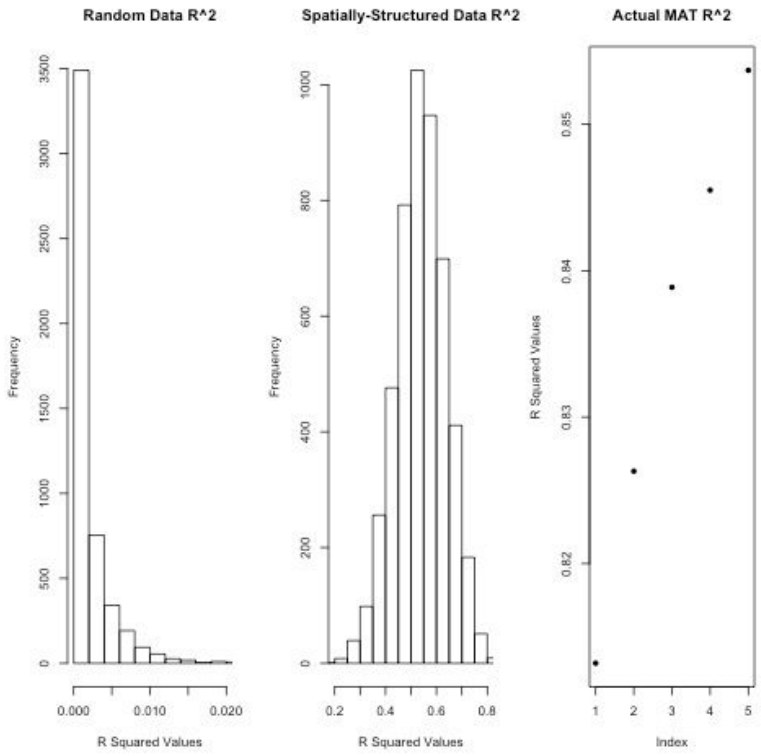
3).



4). MAT uses 5 different analogues.

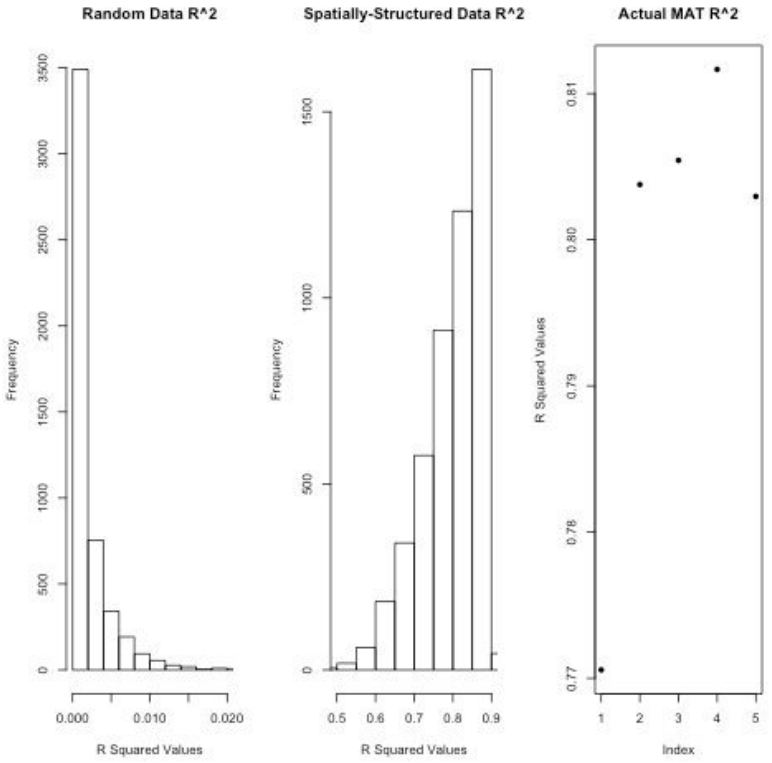
Spatial Autocorrelation





July Temp

Comparing the R^2 values of MAT with random July temp data to MAT with real July temp data, there are clear differences in the model's predictive ability. Using MAT with completely random data generates very low R^2 values that are close to 0. Using MAT with spatially structured data generates higher R^2 values, centered around 0.5-0.6. Using MAT with actual temp data produces the highest R^2 values, around 0.85. This tells us that spatial autocorrelation is important for the MAT technique, as spatially-correlated data can significantly change the model results.

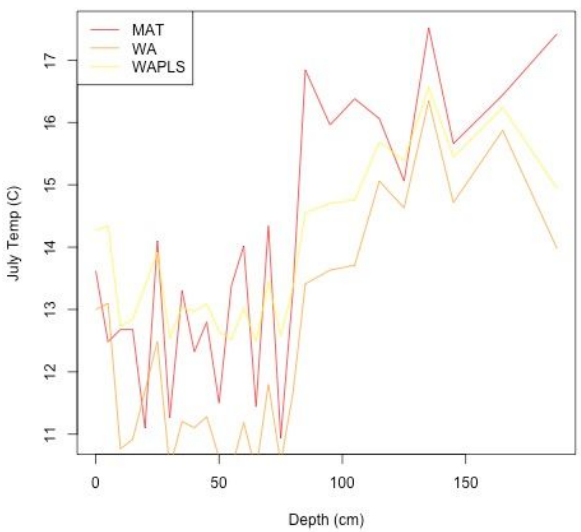


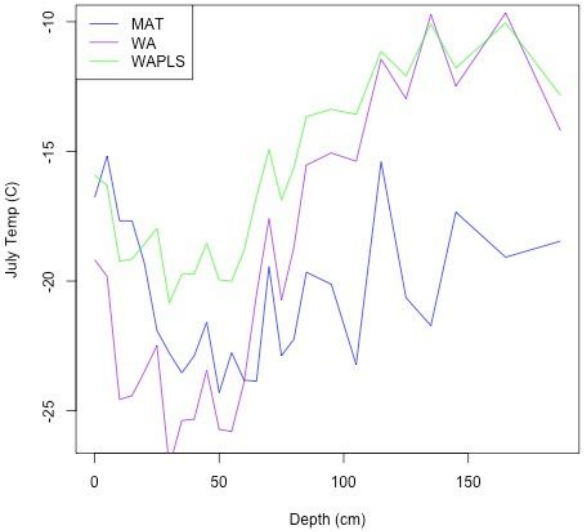
July Sunshine

Looking at the R^2 values for MAT using random July sunshine data vs. actual July sunshine data yields a similar result as July temp. R^2 values are low, around 0, when completely random data is used. The R^2 values are quite high, around 0.85, when spatially structured data is used, and R^2 values are also high when actual July sunshine data is used. Once again, this tells us that spatial autocorrelation has a large impact on the outcome of transfer functions like MAT.

Assessment of Transfer Functions

1). Compare Reconstructions Among Methods

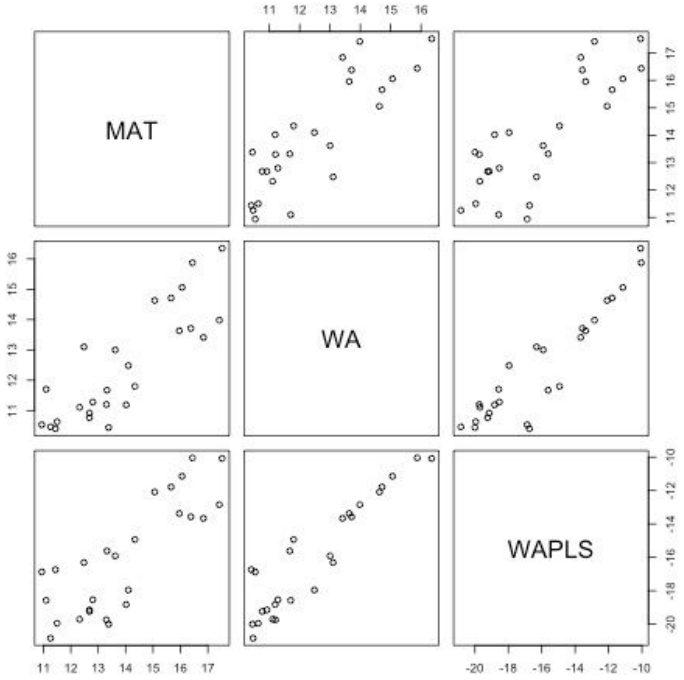




The general trends of the July temp reconstructions agree, as they predict lower July temps from 0 to 75 cm, then a large increase in July temp, then higher July temps for the rest of the record. However, the actual temperatures predicted by the reconstructions differ by method. MAT predicts higher July temps compared to WA, which predicts lower July temps. These different results come from the different ways the reconstructions are calculated, for example MAT is a local method that uses samples close to the sample of interest to calculate the environmental variable, while WA is a global method that uses all samples to calculate the environmental variable.

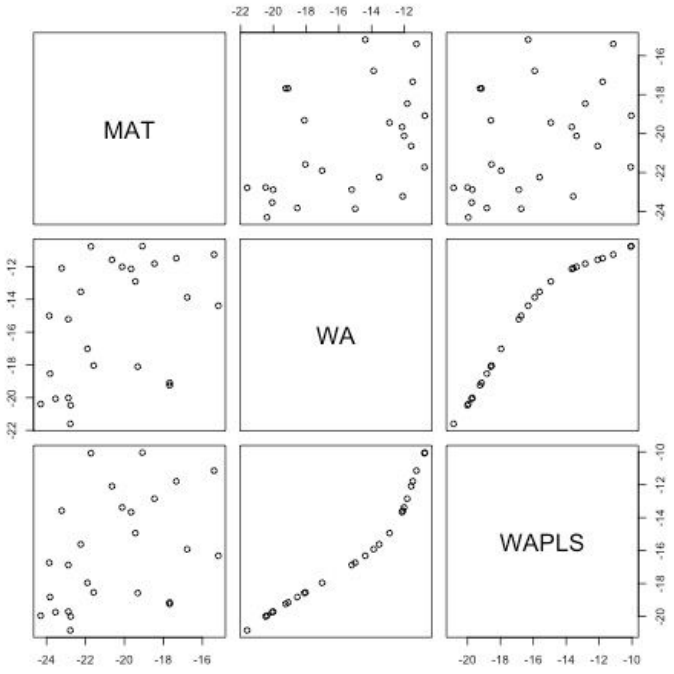
Using the 3 methods of reconstruction for Jan temp, the general trends of the WA and WAPLS reconstructions are very similar, but the MAT reconstruction deviates from these two. I would expect this result because WAPLS is a combination of WA and partial least squares, so it makes sense that the two methods would produce similar reconstructions. MAT is calculated differently, using the 5 closest analogues to the sample of interest, which might explain why this method would produce a different trend.

2). Estimate Correlations of Jan and July Temp for Each Method



July Temp

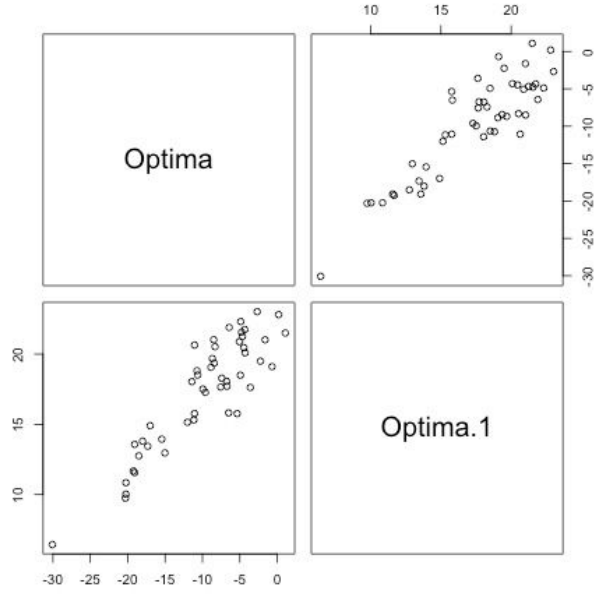
For July temps, the correlation coefficient between MAT and WA is 0.847, the coefficient between MAT and WAPLS is 0.823, and the coefficient between WA and WAPLS is 0.926. From this, it is clear that the WA and WAPLS reconstructions are the most closely related.

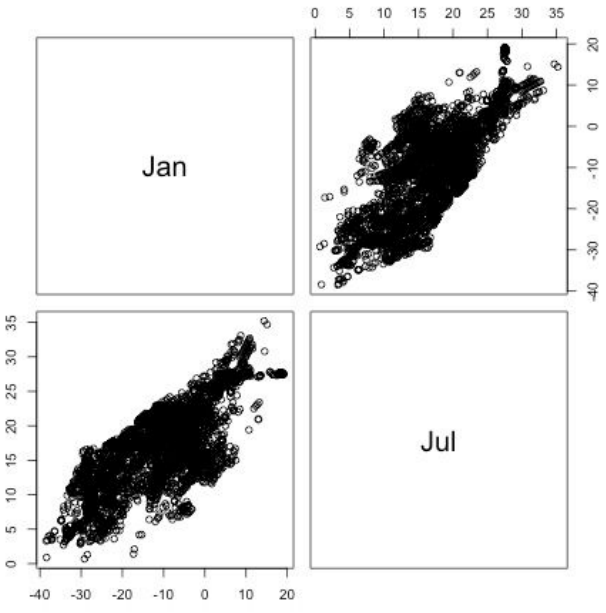


Jan Temp

For Jan temps, the correlation coefficient between MAT and WA is 0.422, the coefficient between MAT and WAPLS is 0.408, and the coefficient between WAPLS and WA is 0.965. Once again, the reconstructions using WA and WAPLS are the most closely related.

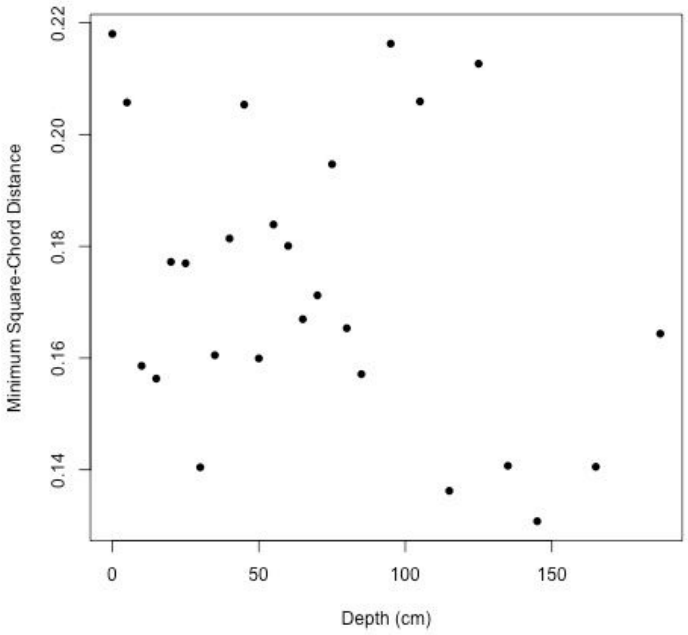
3). Compare Correlations of WA Optima to Correlations between Jan and July Temp



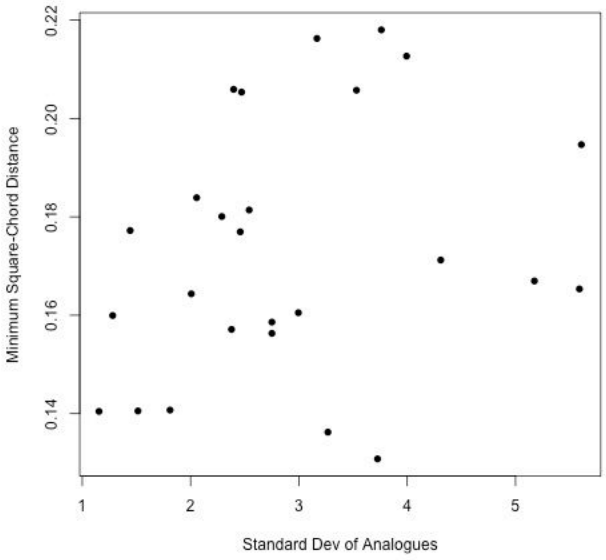


The optimas have an r value of 0.89 and the actual temps have an r value of 0.74, which means the predicted Jan and July temperature optimas are more closely related than the actual Jan and July temperatures.

4). Assess Analog Quality

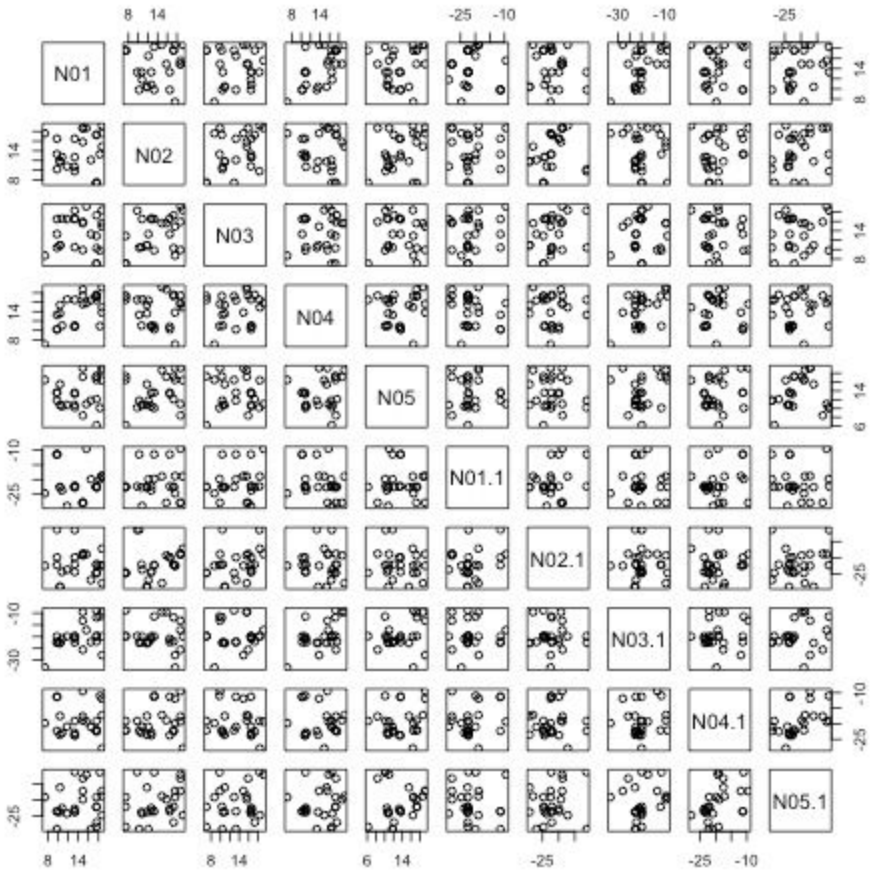


5). Compare Analog Quality and Standard Deviation of Analogs Chosen for Each Sample

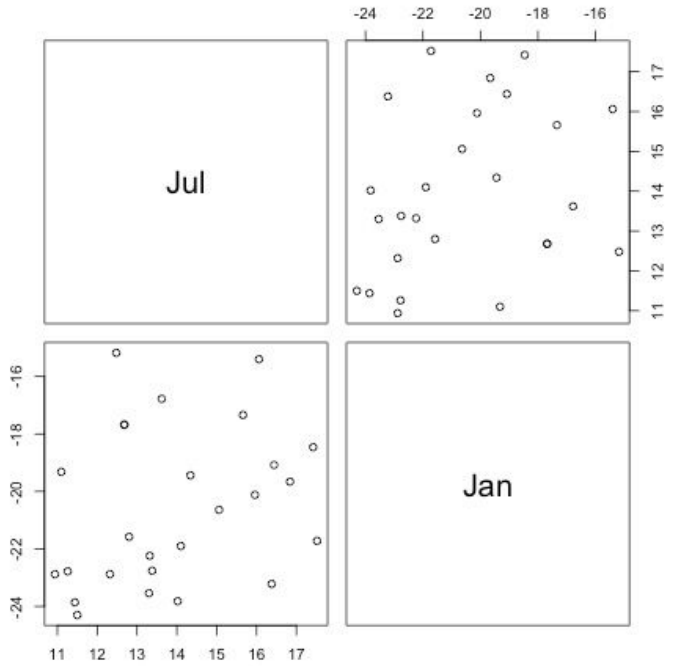


In general, as the standard deviation of chosen analogues increases, the minimum square-chord distance also increases (though this relationship has scatter).

6). Compare Correlations of Jan and July Temp of all Analogues to Correlation of MAT Reconstructions



The correlation coefficients of Jan and July temps for all chosen analogues are low. While the July analogs are positively correlated to other July analogs and the Jan analogs are positively correlated to other Jan analogs, the correlation coefficients never go above 0.6. Many of the July and Jan analogs are negatively correlated with one another, though these coefficients also do not indicate a strong relationship.



MAT reconstructions of Jan and July temps have a correlation coefficient of 0.283, which means these reconstructions are not closely related. This shows that when Jan and July analogs do not have a strong correlation, the reconstructions these analogs produce also do not have a strong correlation.