16/16 KEY

Ian Macnab

Historic weathering rates in the Monmouth area as a function of lithology and weathering indicator:

After examining the tombstone data from our trip to the Monmouth cemetery I came to several conclusions. The first and most important conclusion was that none of the weathering indicators that we used gave satisfactory results. In every one of the graphs for both types lithographic types of tombstone the data plotted as a random spray of points on the graph. In the worst case for granite tombstones the best fit line on the graph showed that the surface of the stone appeared to get smoother as time passed. With limestone the worst was that both % lichen cover and lichen size both trended in the downward direction. However for both limestone and granite the inscription rating gave the best results between the two. This being said the inscription rating result was still poor. The data points were still randomly sprayed on the graph. They were merely the best results of bad data.

There were several problems with our testing. First was the assumption that the tombstones would show weathering more at the top and therefore would be thinner at the top. This would have been an ideal situation. It would have given us empirical data. The problem with this assumption is that almost none of the stones were cut perfectly square. Many of them were tapered side to side and some even were thicker at the top than the bottom. This negated any possible effect of weathering that we might have been able to measure. Another problem was that all of the rest of the data was subjective. Each different group gathering data had a different idea about what a surface smoothness of 3 vs. a 6 felt like. This led to data that jumped all over the place. A third smaller problem was that there was not a very wide range of ages on the tombstones. This was especially a problem with the limestone tombstones. The graphs ended up with a large group of data points between 100 and 120 years old with only a few on either side.

Despite all the problems with our data I think it is possible to learn from it and come away with perhaps a method that might work for the Willamette Valley. Since tombstone inscription rating seemed to give the best results for both tombstone types we would have to come up with a way to standardize the testing. This could mean using only one group to evaluate that variable with a different group assigned to each of the other variables such as surface polish. At least this way there would be fairly consistent evaluation from tombstone to tombstone. An alternate method would be to have multiple groups give a rating for the same tombstone. This way an average rating for that tombstone could be reached and that rating used. A second improvement would be to make sure that a wider range of ages of tombstones was used. This would give a broader distribution on the graph and hopefully a better result. As for using these techniques on a broader scale you would still have a problem. Any measure that is subjective like inscription rating is going to give you variable results as different people use it. You would have to come up with a method that used actual measurements instead of people's opinions. I'm not sure that there is an easy way to do that.

Courtney Stowell
Mid-term
Dr. Taylor
11/9/06

16/16

Tombstone Analysis – Take Home Midterm

First, let me begin by saying that this "was a bad day is science." In my analysis I made graphs of different weathering indicators (everything from inscription rating to lichen diameter). I also separated the data into three categories: limestone, granite and then all of it put together. I graphed these weathering indicators against the exposure time (age in years of the stone). In all of my graphs I did not get very good data to make good implications and conclusions about which weathering indicators were the best and worst. So I am going to discuss which ones I thought would be good and bad indicators and also the variables involved that might have skewed the data.

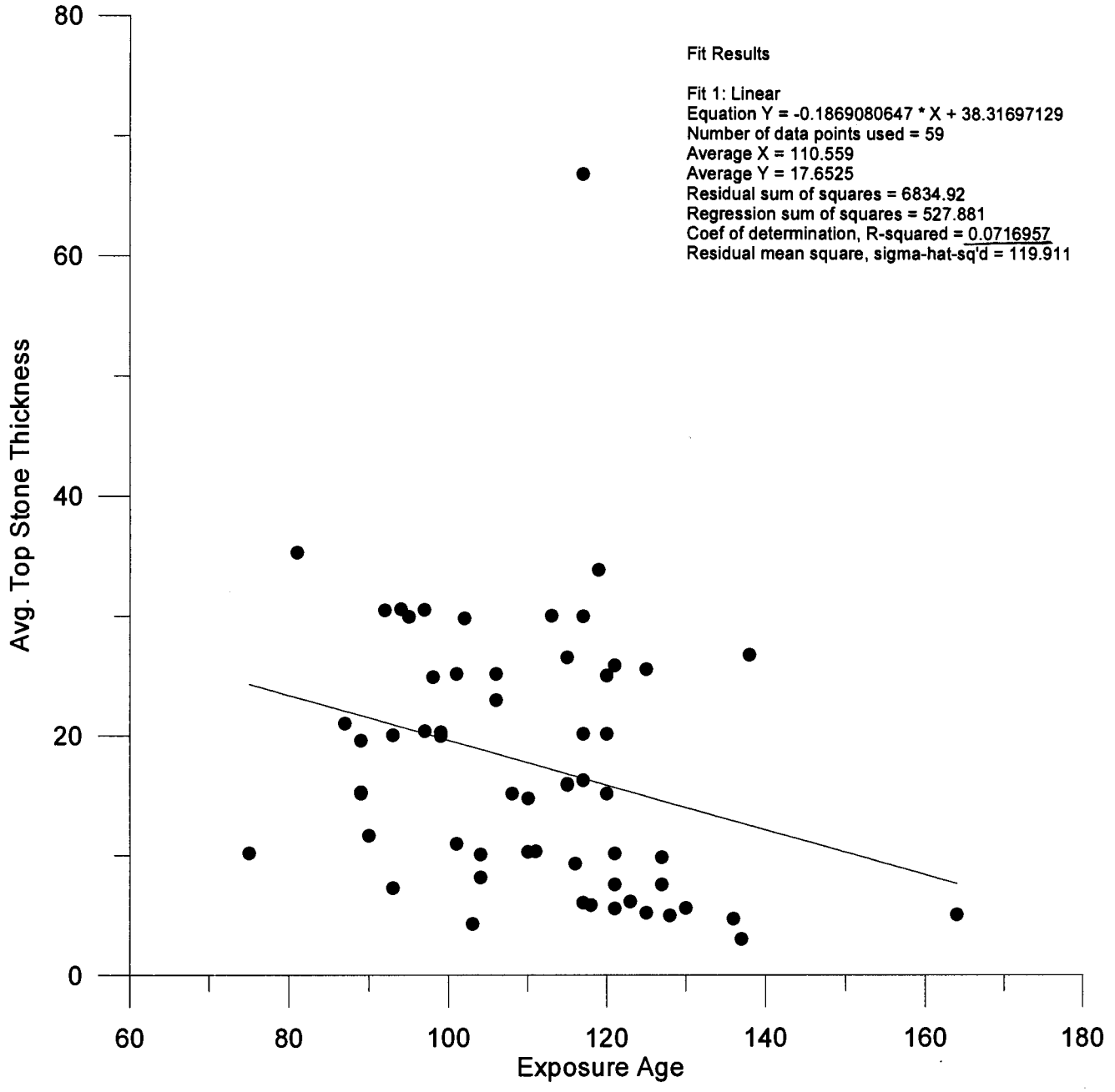
As far as which indicators I thought would be best or worst; I thought for sure inscription rating might give a good indication about how weathered the rock may be. Also, average top thickness or average basal thickness could be a good indicator intuitively because it would show how much the rock had weathered from wind, water, ice, etc. The best R-squared value I got for limestone was .2 (% Lichen/Moss cover), which just tells me that this data is meaningless and "noisy." For granite, the best R-squared value I got was .1 (Inscription rating). Over all, the best value I got was .2 (Polish condition). The worst indicators intuitively would be % Lichen/Moss Cover, Lichen diameter, and Polish condition. I am sure these indicators would vary from granite and limestone and overall but I do not have good data to make any conclusions about anything. This is definitely a bad day in science left with "noisy" data.

Now, let me discuss some of the variables that may have influenced this data to be skewed, not useful, etc. First, we had seven different groups analyzing different tombstones. So, one person's interpretation of inscription rating or polish condition could be different from someone else's. Also, I don't know if other people noticed this but as you are driving up to the cemetery, on the right hand side there are tombs there that have been moved (there was a sign). We do not know where those tombstones came from and there were definitely people over there analyzing tombs and this could very well skew the data. So maybe for next time have people stay on the left-hand side because those have never been moved. Also, we are assuming that the tombstone was placed on the grave within the year that the person died. I mean this is an assumption we have to make but some of the stones could have been put on the grave later than we are assuming which could be another variable that might skew the data.

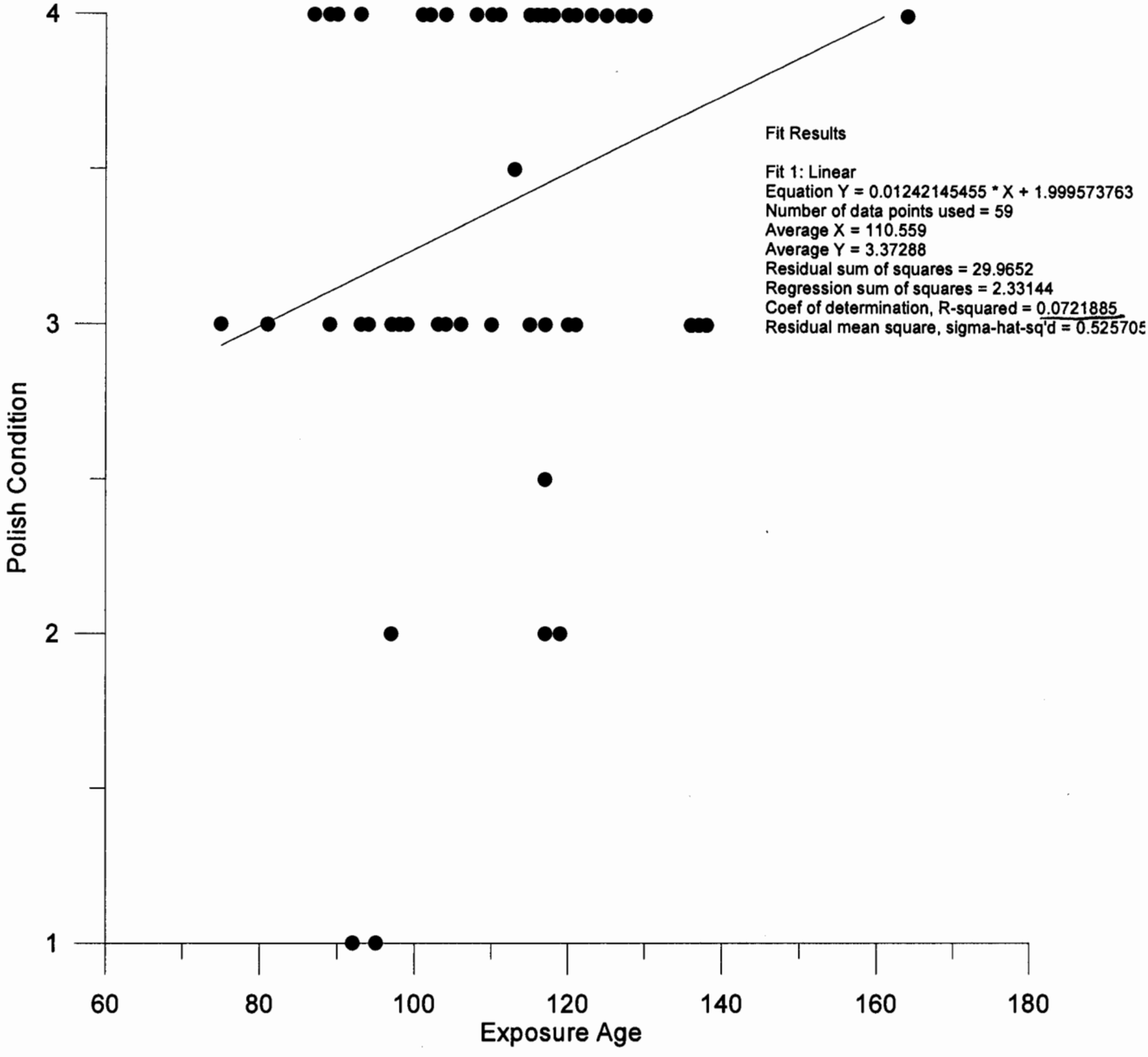
I am not sure what to do to get better, more useful data in the future but one thing that does come to mind is go over more in class about what each indicator means and give examples. Also, once we get to the cemetery take us around and to more than one stone and help us to really understand how to rate the stones.

Note that I did not graph the Inscription aspect because I would have had to change west, east, north, south to numbers and also it doesn't make any sense for me to graph this against exposure age, I would need to graph it against top thickness or basal thickness. Anyway, the morale of the story is I need better data to make conclusions about weathering indicators with each type of stone. But intuitively, Granite would be harder/more difficult to weather and thus last longer but I do not have the data to back up my hypothesis. So again, its just a bad day in science left just with "noisy" data (that looks likes shotgun power when graphed-all over the place-no real pattern).

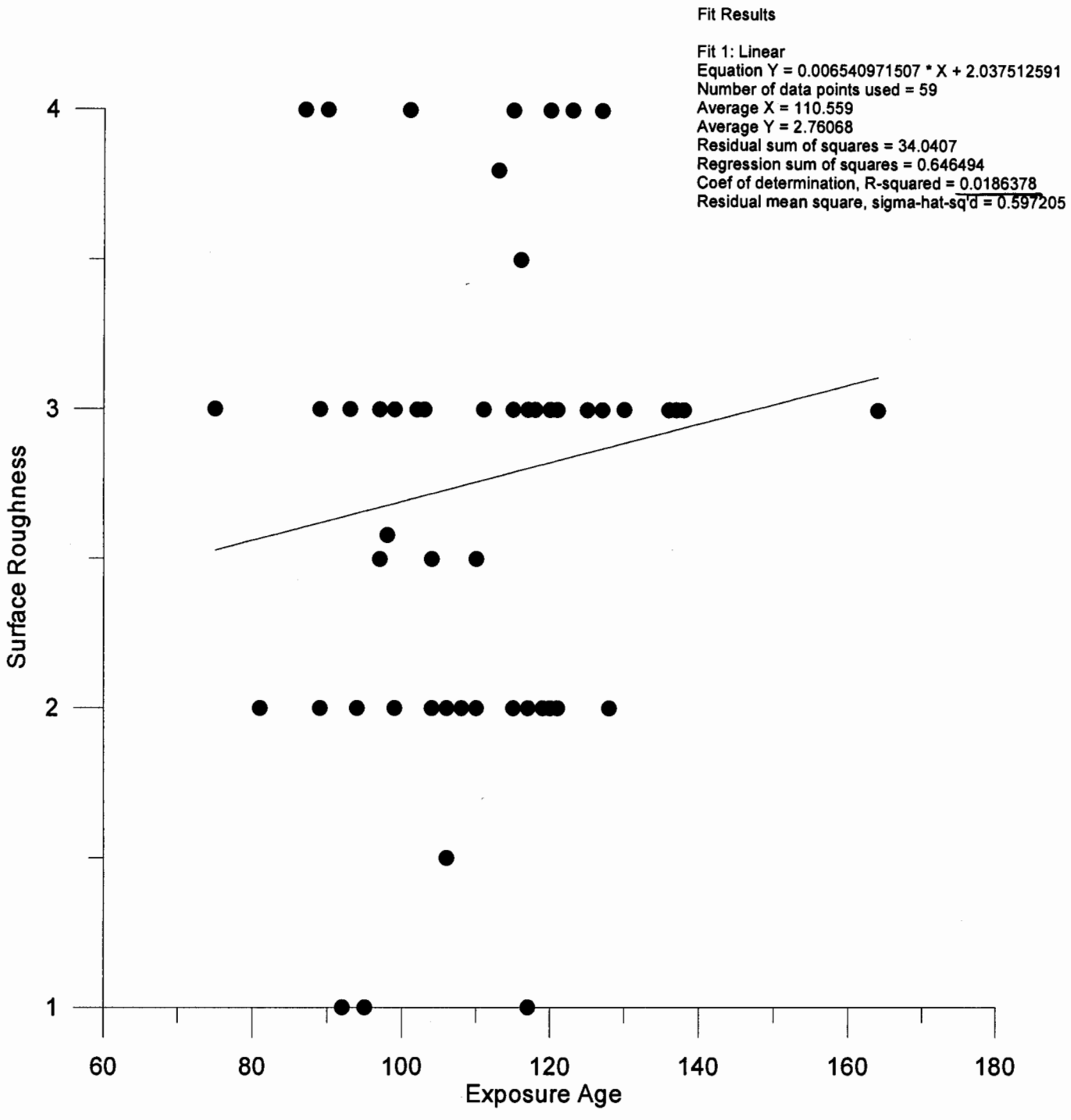
Monmouth Cemetary
Limestone Weathering



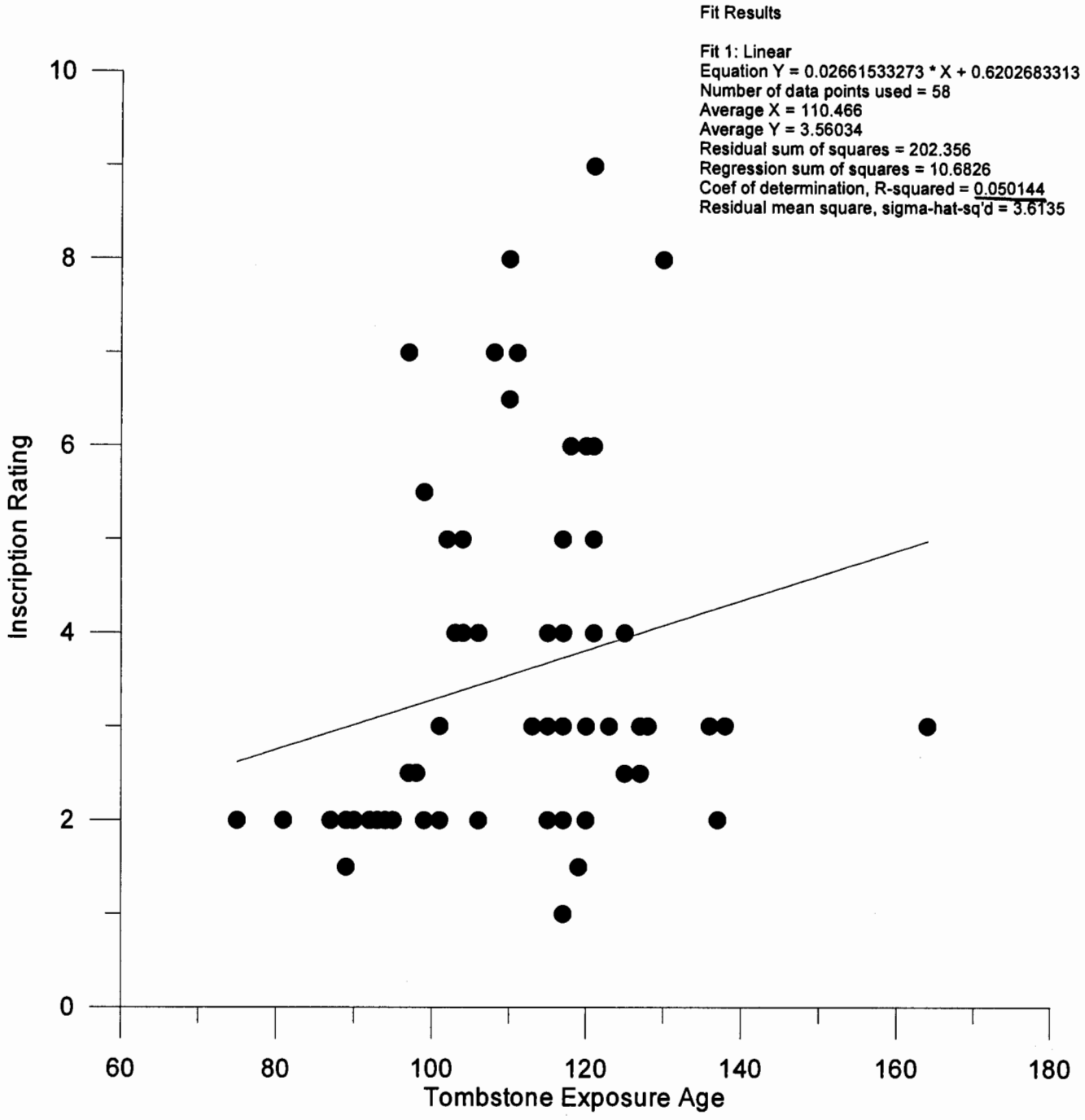
Monmouth Cemetary
Limestone Weathering



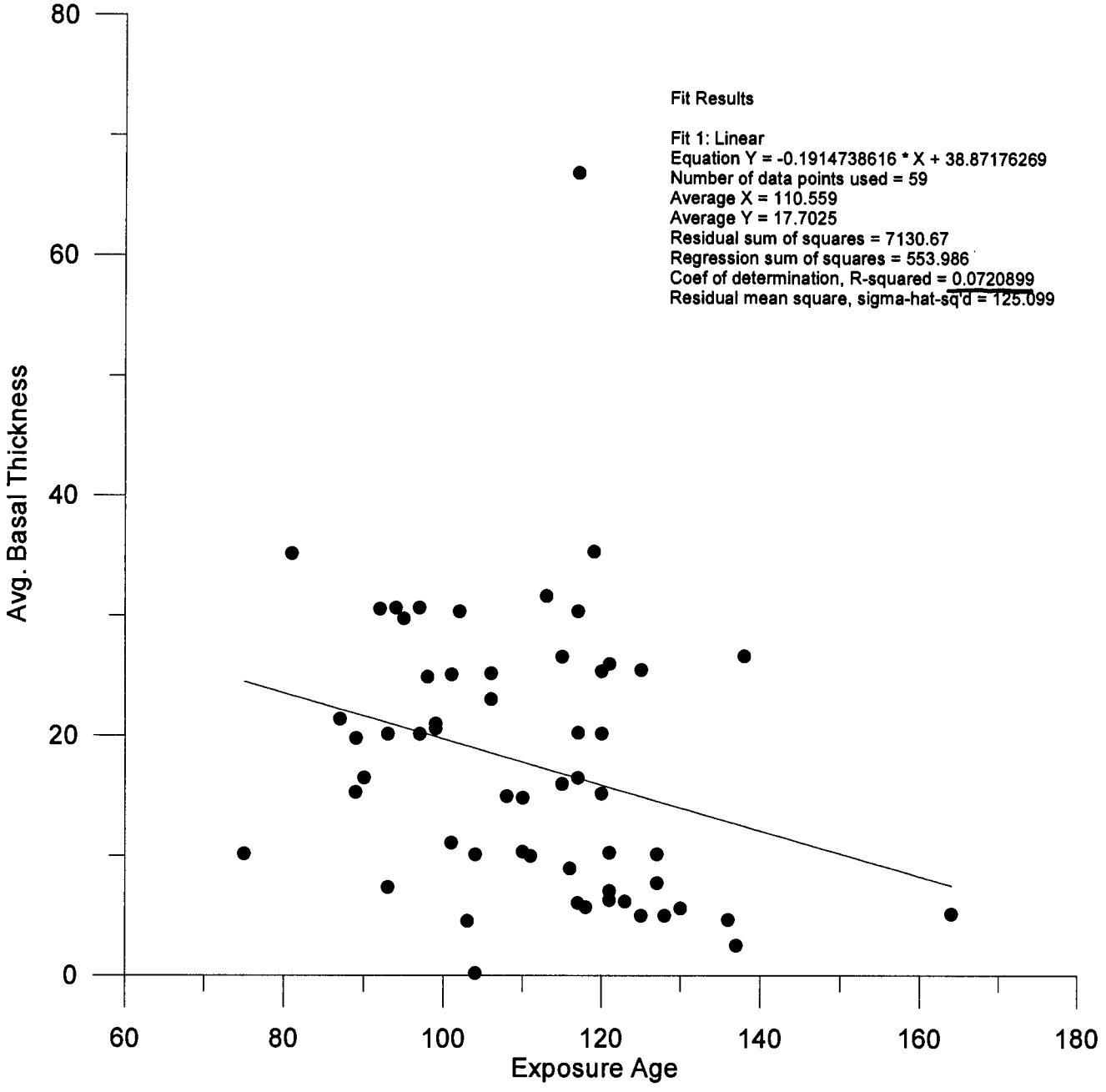
Monmouth Cemetary
Limestone Weathering



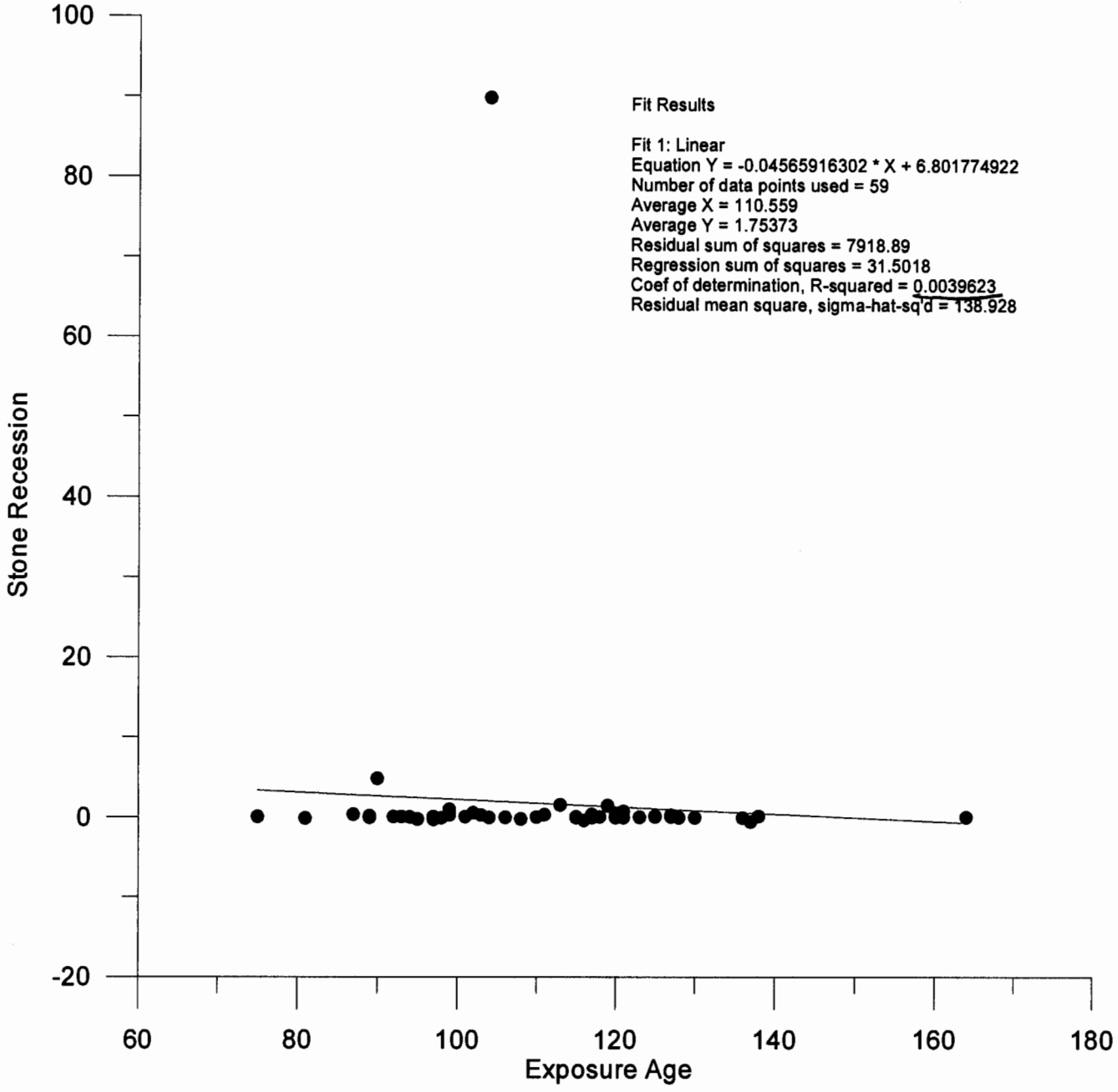
Monmouth Cemetary
Limestone Weathering



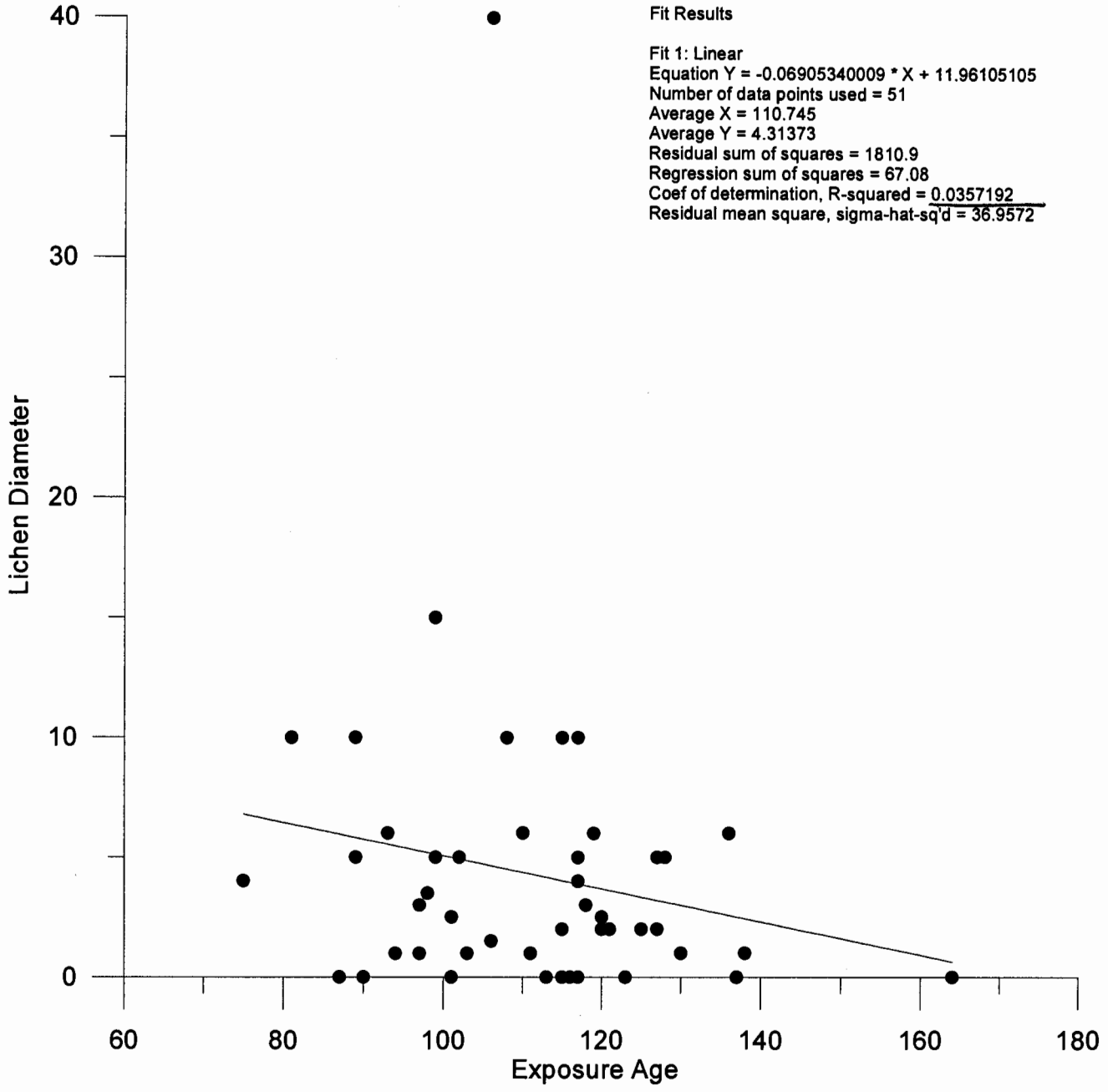
Monmouth Cemetary
Limestone Weathering



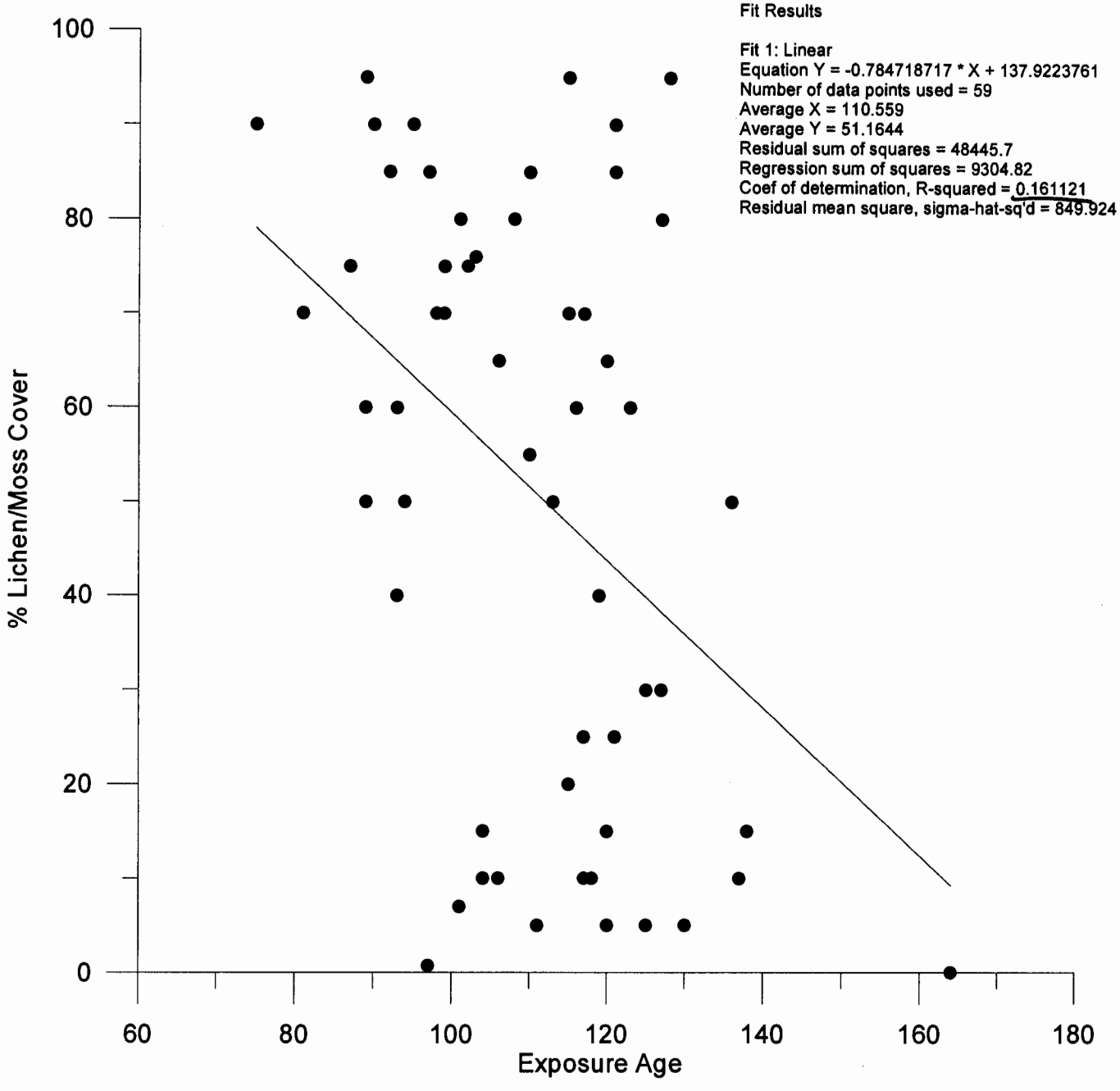
Monmouth Cemetery
Limestone Weathering



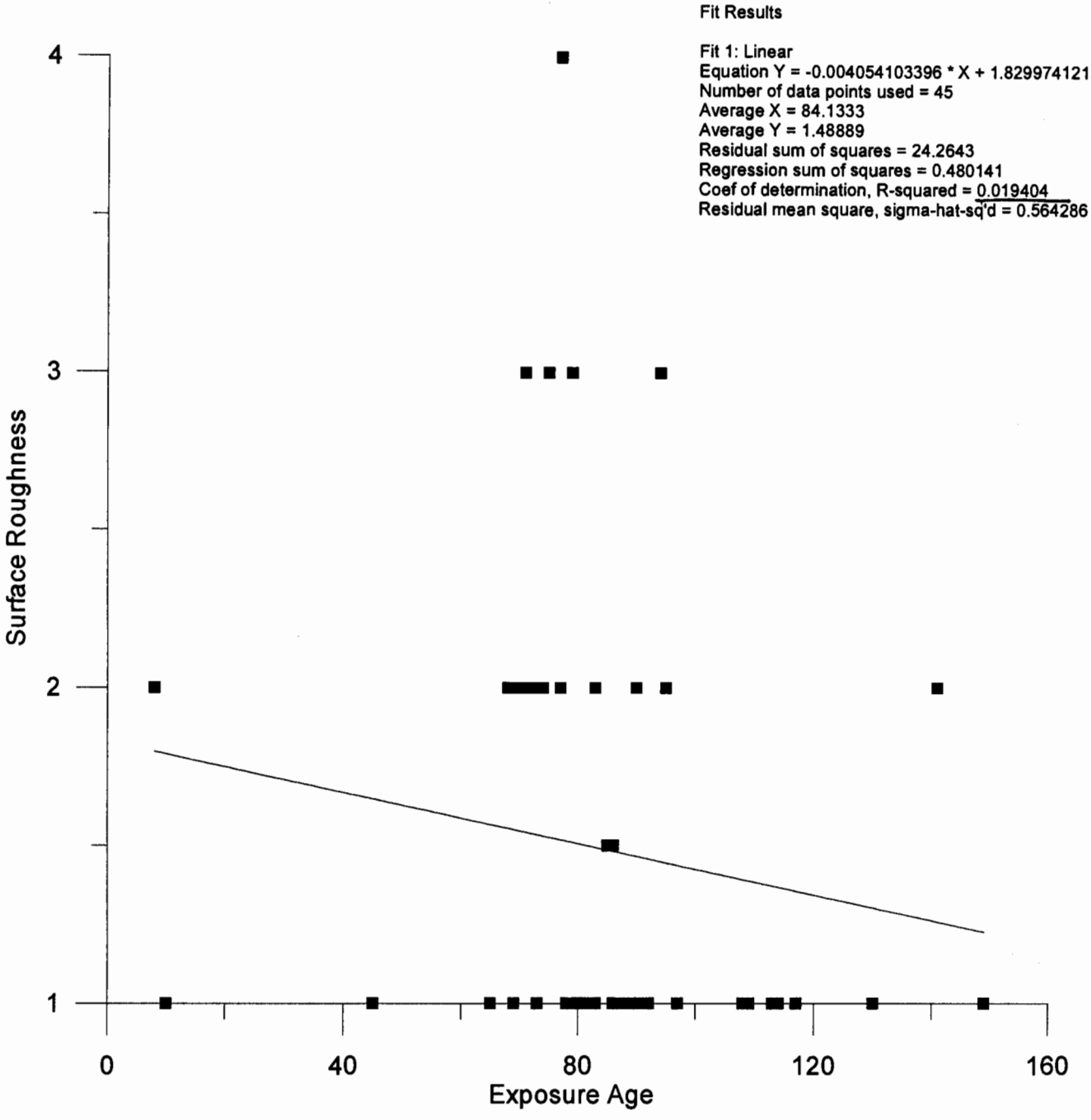
Monmouth Cemetery
Limestone Weathering



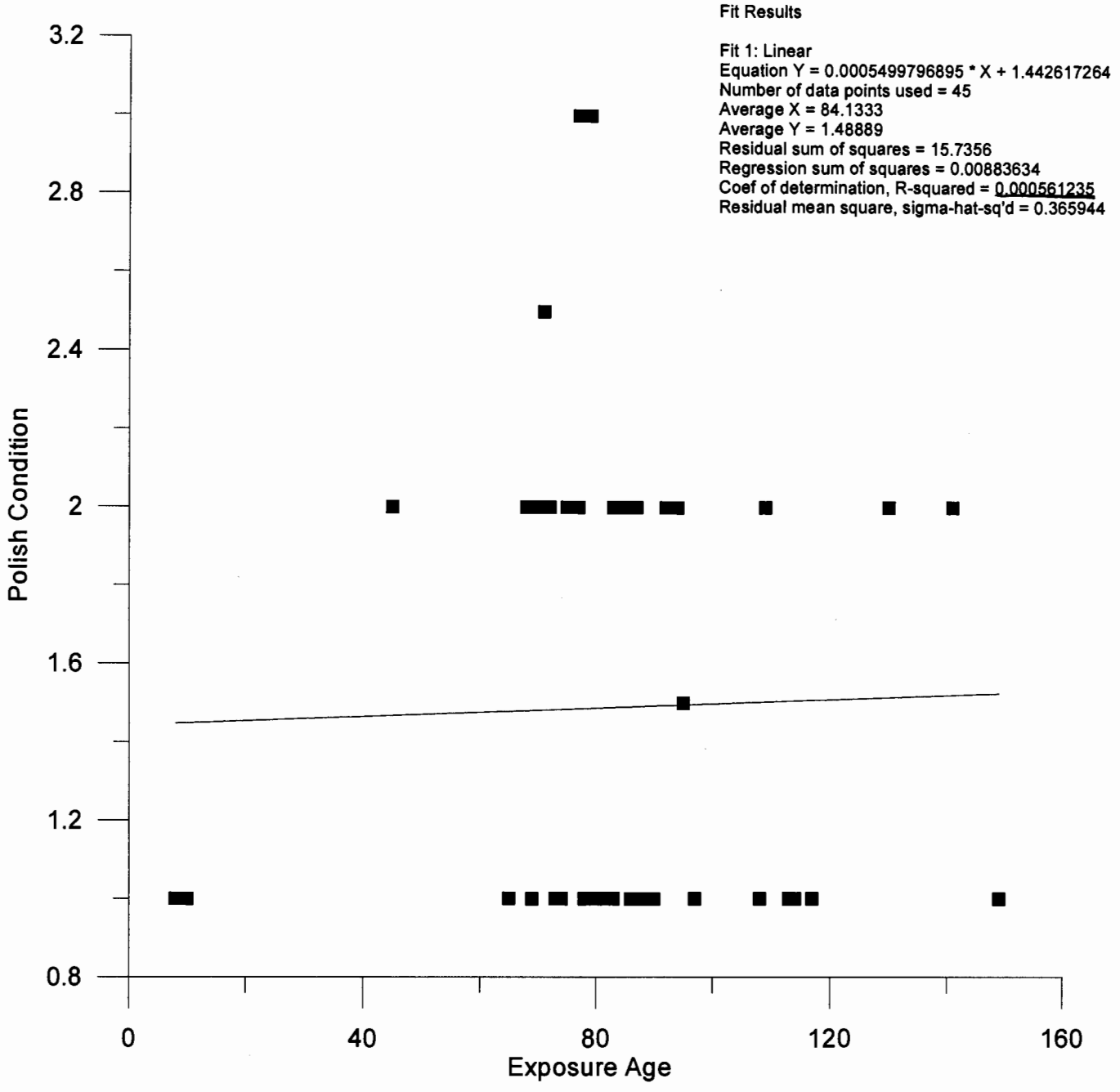
Monmouth Cemetery
Limestone Weathering



Monmouth Cemetary
Granite Weathering



Monmouth Cemetary
Granite Weathering



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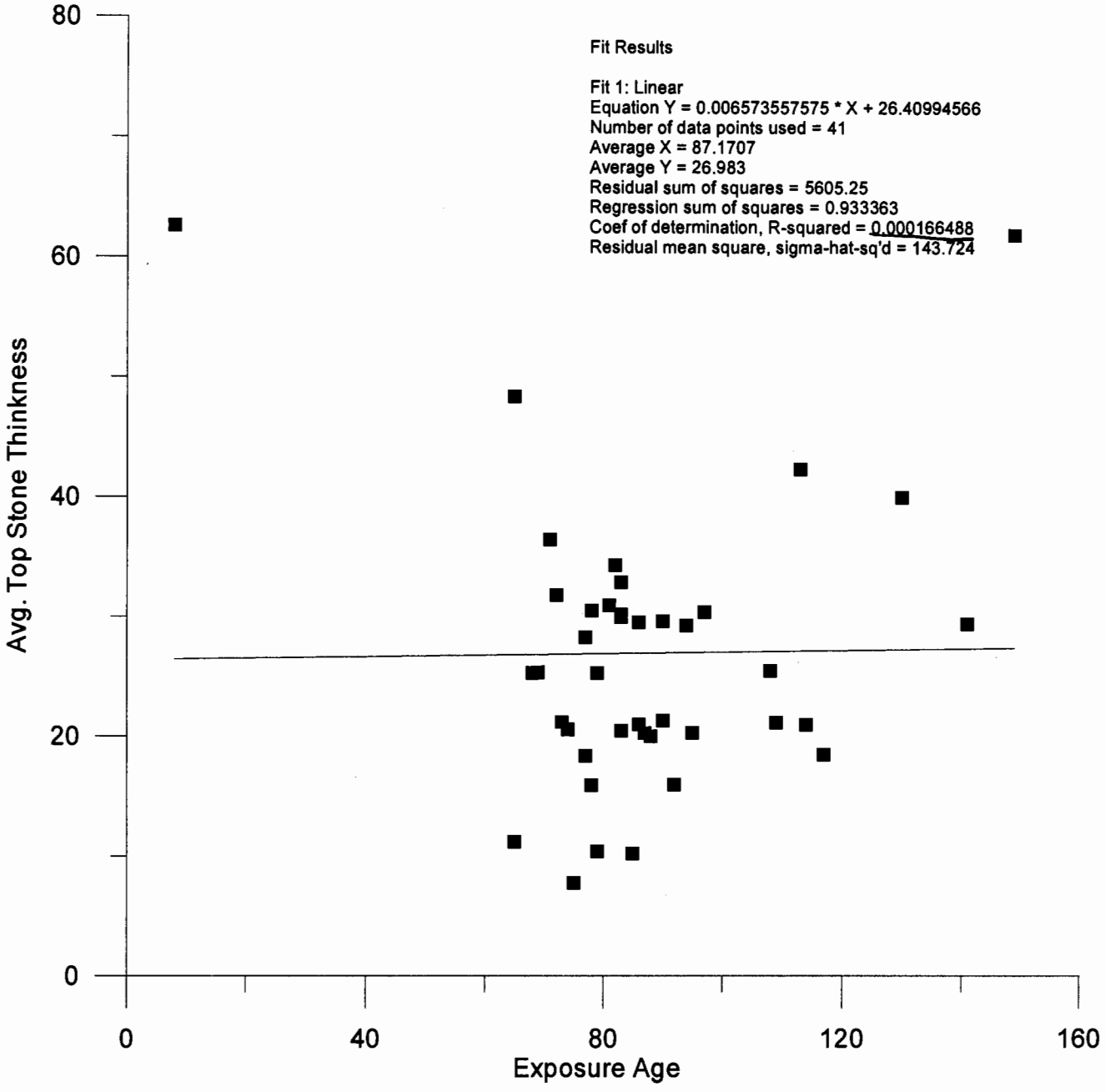
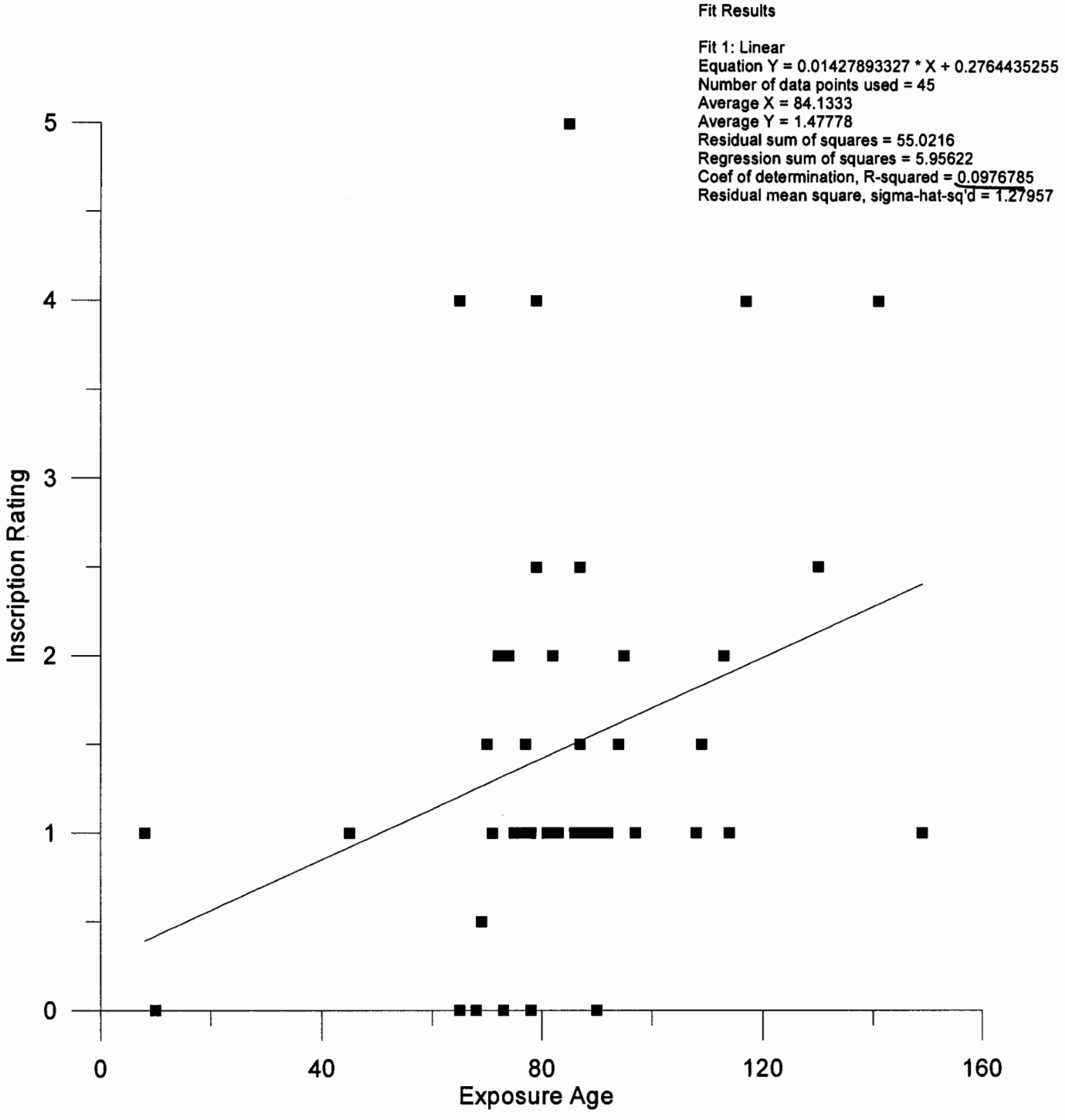
Granite Weathering



Monmouth Cemetary
Granite Weathering



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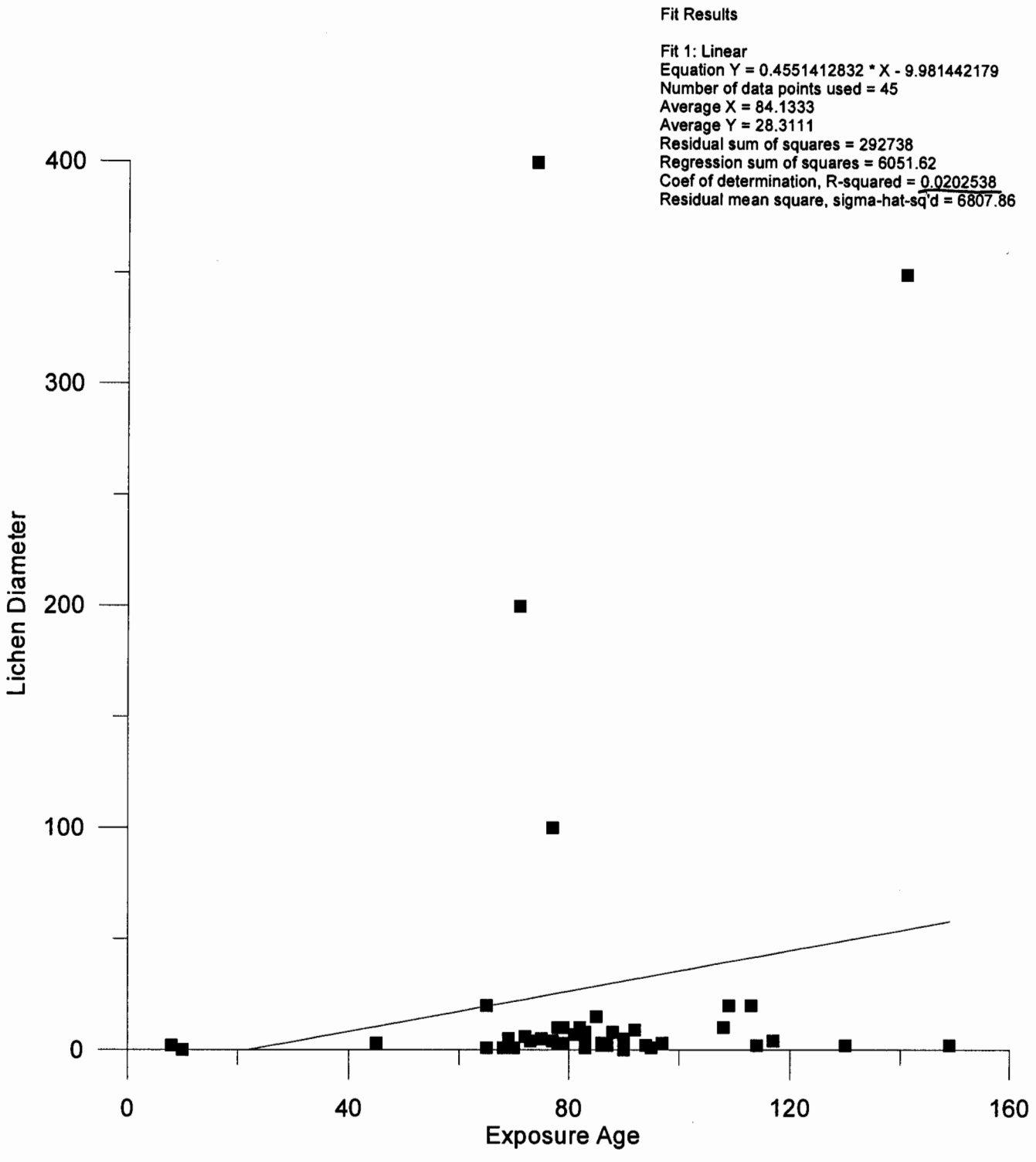
Granite Weathering



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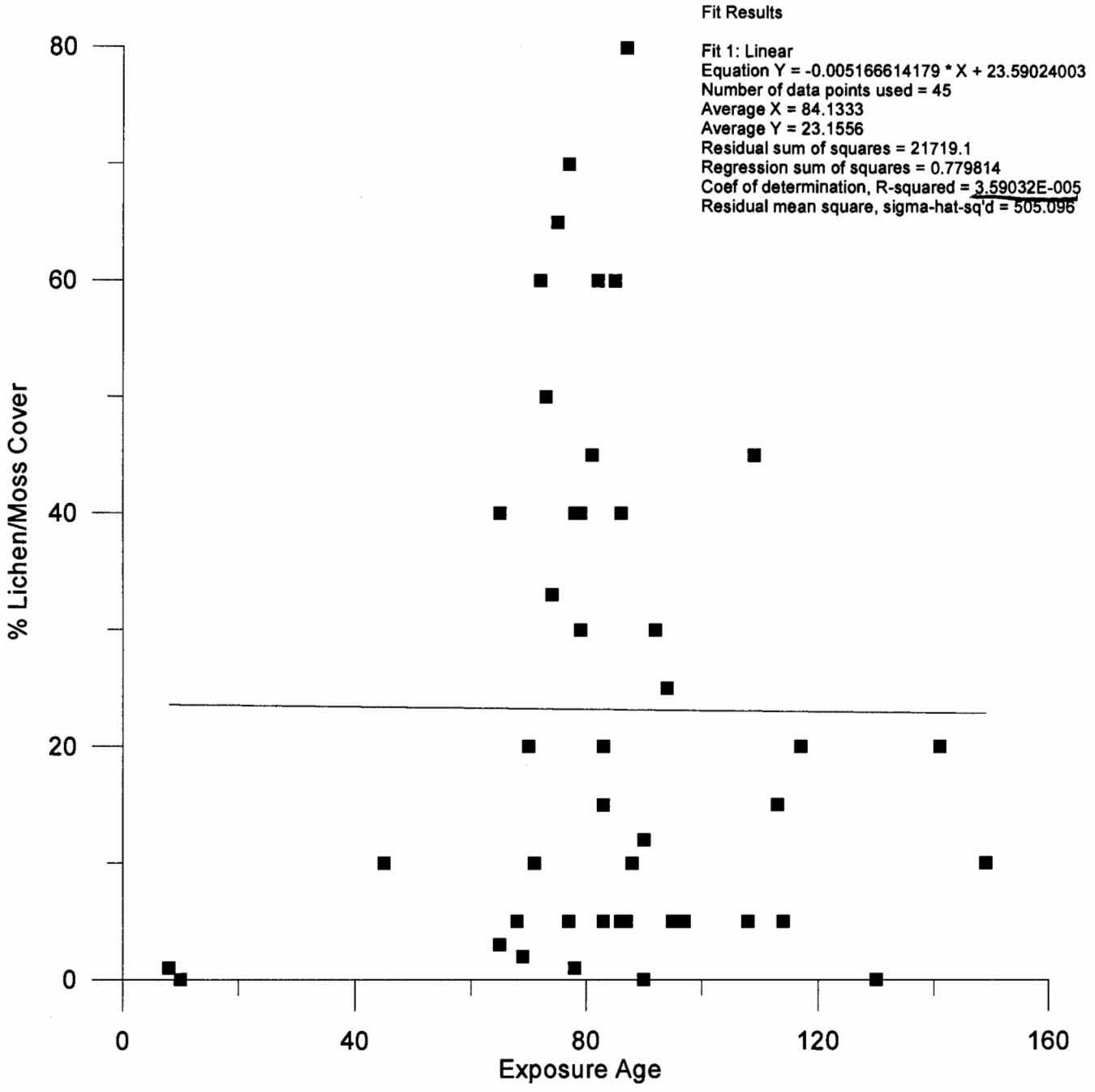
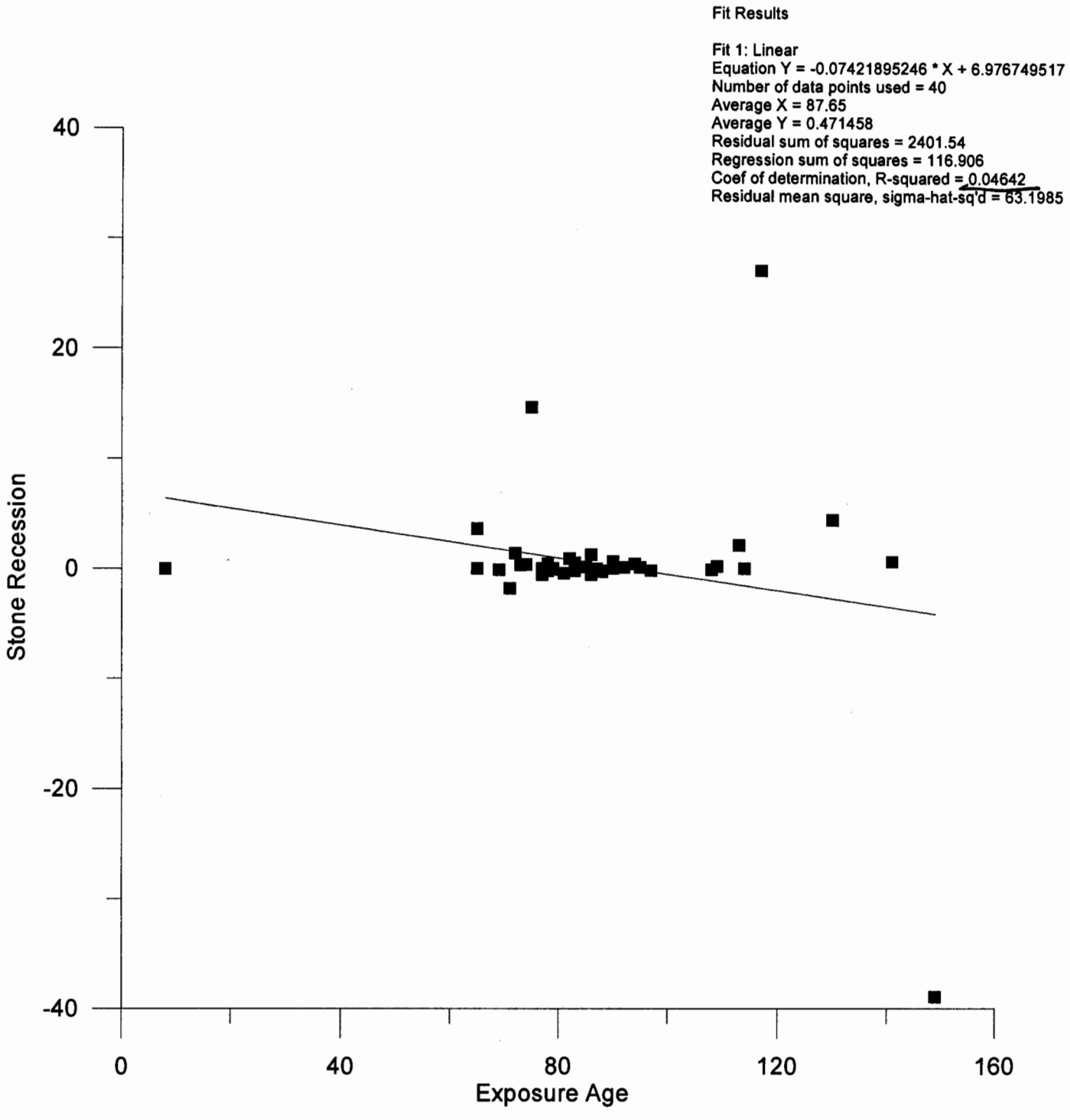
Granite Weathering



Monmouth Cemetary
Granite Weathering



Monmouth Cemetary
Granite Weathering