San Joaquin River Grain Texture Analysis

Ana Ceballos, Mara Brady

Department of Earth and Environmental Sciences

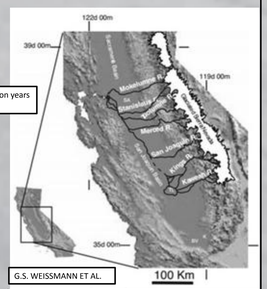
2576 E. San Ramon Ave. M/S ST24, Fresno, CA 93740

Sediment and Water Research Group

Abstract:

The purpose of this research in the bigger picture is to better anticipate future river flow of the San Joaquin River. By studying the sediments transported from the Sierra Nevada into different formations of rivers such as Turlock, Riverbank and Modesto, we hope to know more about what caused different river flow, sediment transportation and why. Samples from different outcrops in the Fresno quary have been collected and documented by another Fresno State Student. The samples were sieved and measured by phi size then classified by lithofacies. Lithofacies are grouping of rock units with similar lithologic (texture, composition, sed. structures) features. Those used for this project are clast supported massive gravel (GCM), gravel stratified (GP), and clast supported crudely bedded gravel (GH). The GCM lithofacies is one that is more gravity driven instead of stream driven. Lithofacies GH and GP are more water or stream driven. In order to easily view trends and patterns amongst the sample's roundness, shininess and roughness, the information has been organized on graphs that group similar lithofacies to compare to those that are not similar. Since facies GH and GP are both water driven versus GCM which is more gravity driven, data from lithofacies GH and GP are graphed together to compare to GCM. Through this process it is possible to see if the processes acting on sediment transport and deposition influence textural features of the sediments.

Geologic Background:

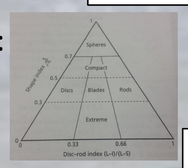


- Sierra Nevada Mountains (10,000 to 1 million years old went through glacial and interglacial periods.
- During glacial periods, the sediment transport is greater; while during interglacial periods, the sediment transport decreases.
- Several cycles of glacial and interglacial periods resulted in three rock and sediment formations: Modesto, Riverbank and Turlock. (sediments from river)
- Sediments that were transported through these rivers were collected from the Fresno Cemex Quarry.
- Sediments collected were classified into lithofacies.
- Lithofacies: groups of units based on similar lithological characteristics that relate to the depositional environment
- Lithofacies GH & GP are water driven, meaning that sediments were transported by water.
- Lithofacies GCM are gravity driven, which means that the sediments were transported by gravity.

Methods:

Measured & Scored:
- Round vs. Angular
- Shiny vs. Dull
- Grain Shape
- Rough vs. Smooth
- Plotted frequency of attributes in each lithofacies.

1	2	3	4
Very Dull	Dull	Shiny	Very Shiny

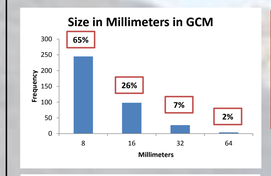


1	2	3	4	5	6
unrounded	angular	subangular	poorly rounded	rounded	well-rounded

(high sphericity / low sphericity)

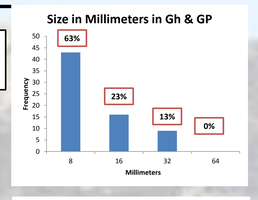
1	2	3	4	5	6
Very rough	Rough	Semi-rough	Semi-smooth	Smooth	Very Smooth

Results:

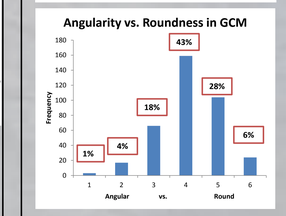


Millimeters	Frequency
8	244
16	98
32	27
64	4
Total: 373	

- Similar percentages across all sizes.

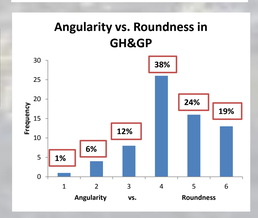


Millimeters	Frequency
8	43
16	16
32	9
64	0
Total: 68	

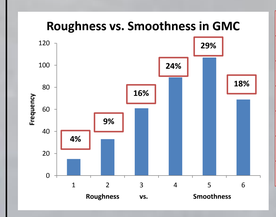


Bin	Frequency
1	3
2	17
3	66
4	159
5	104
6	24
Total: 373	

- Similar percentages across angularity scale.

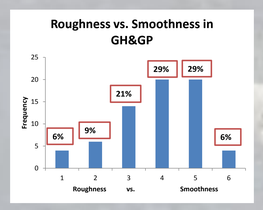


Bin	Frequency
1	1
2	4
3	8
4	26
5	16
6	13
Total: 68	

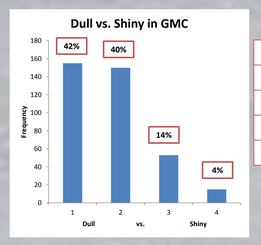


Bin	Frequency
1	15
2	33
3	61
4	89
5	107
6	69
Total: 373	

- Similar trends in percentages across the roundness scale.

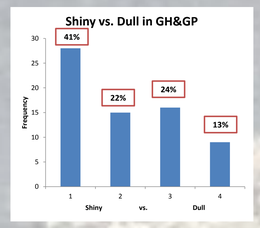


Bin	Frequency
1	4
2	6
3	14
4	20
5	20
6	4
Total: 68	



Bin	Frequency
1	155
2	150
3	53
4	15
Total: 373	

- Similar trends in percentages of same scale of shininess or dullness.



Bin	Frequency
1	28
2	15
3	16
4	9
Total: 68	

Discussion:

- Per the graphs, most of the textural features are similar between the gravity driven lithofacies, GCM, and the stream driven lithofacies, GH & GP in samples 8 mm and bigger.
- Even though these sediments were deposited by different forces (gravity & water), the textural features are quite similar
- Several factors influence these 5 textural features.
- While we don't see any obvious links between these specific features and their lithofacies, these samples may have features that are indicative of their previous transport before their final depositional area.

Conclusion:

- These 5 textural features alone cannot predict the depositional location of the samples due to other factors' possible influence on the features of the samples (i.e. previous path of transport, longevity in system etc.)
- It is an important finding because we now know that the final depositional process may not be the most important factor on the sediments' textural features.
- This is important when we are using textural features to interpret something about the environment.
- Extension: Will working with the smaller sizes of these samples change if we see any correlation between these textural features and the lithofacies?
- Extension: Are these textural features accurate indicators to tell us what formation the samples where found in (Modesto, Riverbank or Turlock)?

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