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Forward thinking. World ready.

Sediment Analysis of Sediment Core from Montague Cave, Jackson County, Alabama

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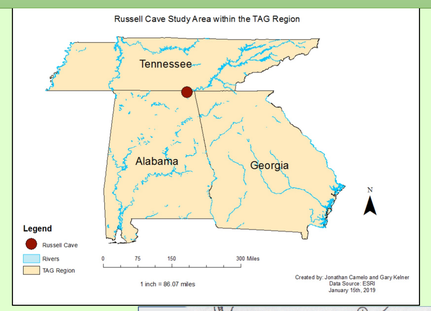
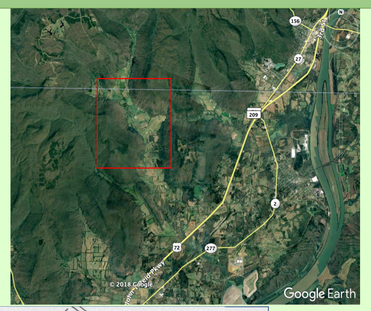
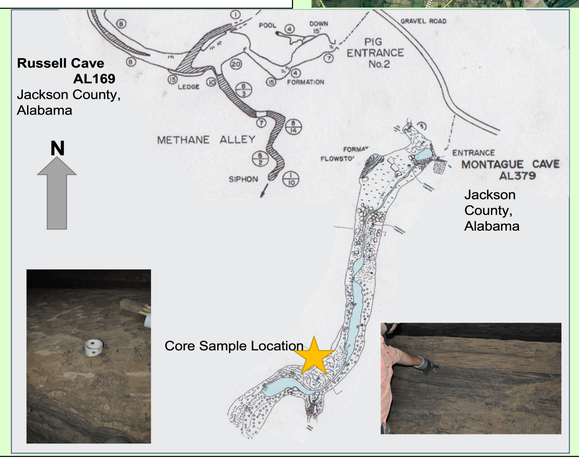
Introduction

This project is a continuation of a previous study(Camelo, 2020) and seeks to understand the way that water content, organic content, and grain size distribution are distributed across a core taken from a cave system near to the original study. It is trying to further build upon the understanding of sedimentation in caves in the region of Jackson County, Alabama. The location of the core was in Montague Cave, a part of the karst region in the tri-state area of Tennessee, Alabama, and Georgia. The Core was taken from a disjointed section of the original studies location. Additionally, this study seeks to familiarize the Author with the laboratory techniques and procedures while increasing on the limited number of cores in the area to another cave in the region. The core was partitioned into individual samples and those samples were dried. The organics were driven off through subjecting the samples to high temperatures. The samples were then run through a set of sieves to determine the distribution of grain sizes for the sample. Using the data from the samples an interpretation of the core as a whole is possible.

Core Sample Location







The Core was taken from Montague Cave at the first major bend towards the Northwest wall. Montague Cave is located in northeast, Alabama. The region has a subtropical climate that receives high amounts of precipitation annually. Sediment deposits are under the influence of the regional base-level of the Tennessee River. The formation of the cave is located in a valley known as Doran Cove, along the Cumberland escarpment.(Camelo, 2020)

Methods

In order to analyze the sediments in the core we divided it into small one-to-two-centimeter sections that were the individual samples. A portion of the samples were placed into crucibles and weighed. They were then placed into a 100℃ oven to dry over a period of 48 hours. The Samples were then weighed again and placed in the muffle furnace at 500℃ for at least four hours to drive off the organic materials in the sample. The samples were then allowed to cool and were weighed for a third time. The samples are then run through a set of sieves to separate the different grain sizes. The Sediments caught in each of the sieves were weighed for the weight of the individual grain sizes.

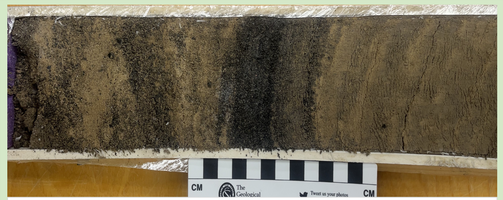
Equipment

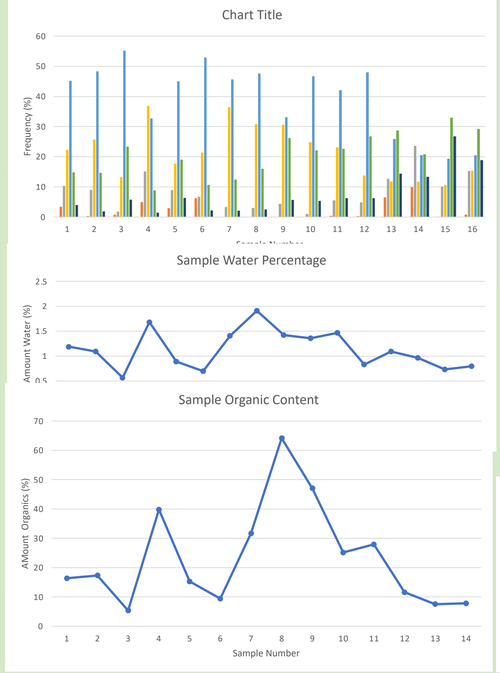
a)The drying oven that was used to remove water from the samples(Left). The Muffle Furnace used to remove the organics from the samples(Right). b) The set of sieves used to separate the grains for the grain size analysis.

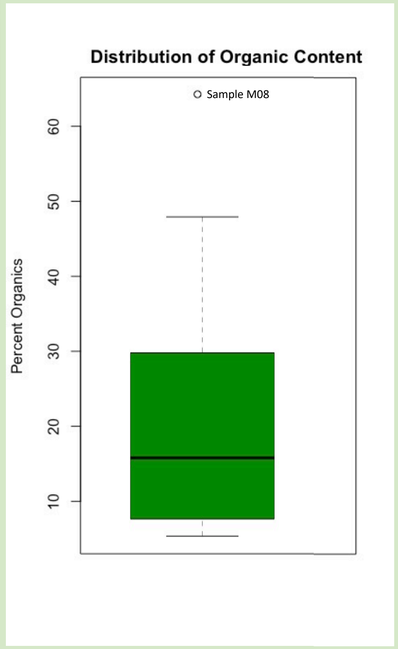
Results

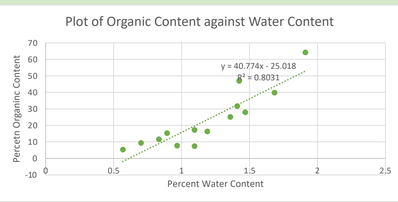
Using $\frac{(Initial\ Weight - Dry\ Weight)}{Initial\ Weight} \times 100$ we can find the percentage of water content. In doing this it was found that the sample with the highest water content was sample M08 with 1.91% water, the lowest was M03 0.57%. The average water percentage across all samples was 1.13%. We can do a similar calculation to determine the percentage of organic content in the samples with $\frac{(Dry\ Weight - Post\ Muffle\ Furnace\ Weight)}{Initial\ Weight} \times 100$. Doing this calculation, it was found that the sample with the highest organic percentage was sample M08 with 64.17%, the sample with the lowest organic content was M03 with 5.36%. Across the samples the average was 21.17% when sample M08 was included it was 18.31% when M08 was excluded. Across all the Samples the average grain size was between 0.25mm and 0.125mm.

Sample Name	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12	M13	M14	M15	M16
Location on Core	2-4cm	4-6cm	6-8cm	8-10cm	10-12cm	12-14cm	14-16cm	16-18cm	18-19cm	19-20cm	20-21cm	21-22cm	22-24cm	24-26cm	26-28cm	28-30cm









Discussion

When looking at the Data there is a distinct trend of the grain sizes becoming finer as it goes down the core. This distinct change shows us that there was a distinct change in the flow conditions. Which has brought in more organics and deposited more coarse sediments. Weather that is something like a flood pulse or channel alteration is yet to be determined. The Organic Content doesn't follow that same trend as the grain size. The organic content fluctuates throughout the core with it being focused more on the upper half with the greatest concentration being in the middle of the core. The locations of highest organic content corresponding to the dark bands in the core. Which points to that there is little organic staining of the core. The residual water content of the core correlates highly with the organic content of the core. This shows that the water was trapped mostly in the organic content rather than the interstitial sites of the clay minerals.

References

Camelo, J., 2020. Analysis of Clastic Cave Sediment in a Fluviokarst System, Russell Cave, Northeast Alabama.

Acknowledgements

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