Concretions found in Tertiary Sands Along Ecleto Creek in Southern Texas

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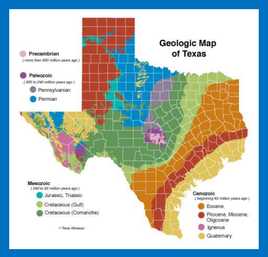
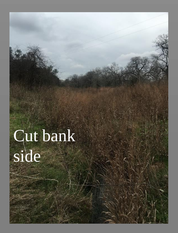
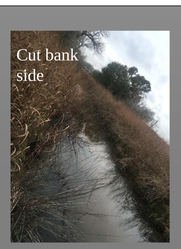


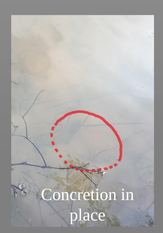
http://texasalmanac.com/topics/environment/geology-texas-0

ABSTRACT

Cemented nodules, or concretions are fairly common in the geologic record. Nonetheless they are important proxies for the understanding of processes occurring in Earth's critical zone. Histories can be complex because of overprinting by multiple diagenetic processes.
Previously un-described decimeter scale spheroidal – ellipsoidal concretions have been found in Tertiary aged strata (Reklaw Formation) within Ecleto Creek, in Wilson County south of Seguin, Texas. These concretions eroded out of the cut bank side of the creek after heavy rains and high water flow. Thin section petrography, cathodoluminescence, and electron microscopy are used to describe the fabric, lithology as well as the nature of the cement.
The concretions are banded with four apparent zones, of variable petrography, and are hollow; there is no evidence of a nucleus other than some very loose fine-grained, sub rounded, frosted quartz. The interior void of the concretions vary in size from one to the next ranging from 5-15 cm. The outer most part has smaller nodules of hematite on the surface of the concretion itself. The next layer consists of mostly angular to sub-angular quartz grains, with trace amounts of other minerals such as glauconite and fluorite; it is also rich in a black non-crystalline material, resembling spherules, which is yet to be confirmed. The third layer is extremely thin and has darker brown bean shaped grains, which may be hematite; as well as sub-rounded quartz grains. The fourth layer contains angular quartz grains more of the black non-crystalline material and yellowish limonitic cement.
These concretions are unusual in the sense that they have no obvious nucleus and are hollow. They have petrographically distinct layers. Nodules such as these have application to the understanding of sedimentary diagenesis on Mars, which has an iron-rich waters and documented spherules.

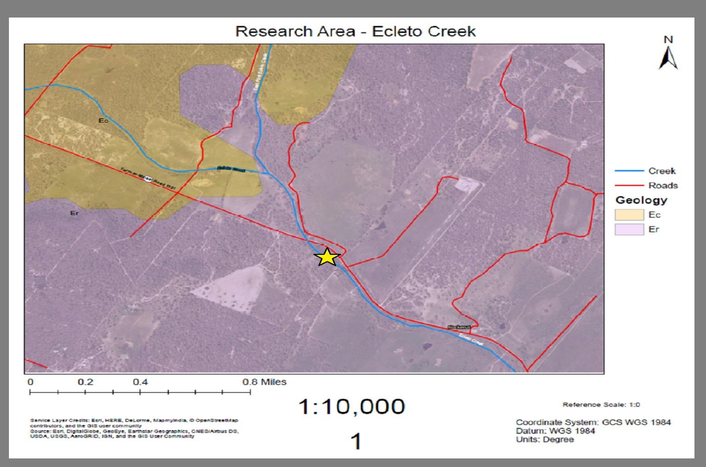




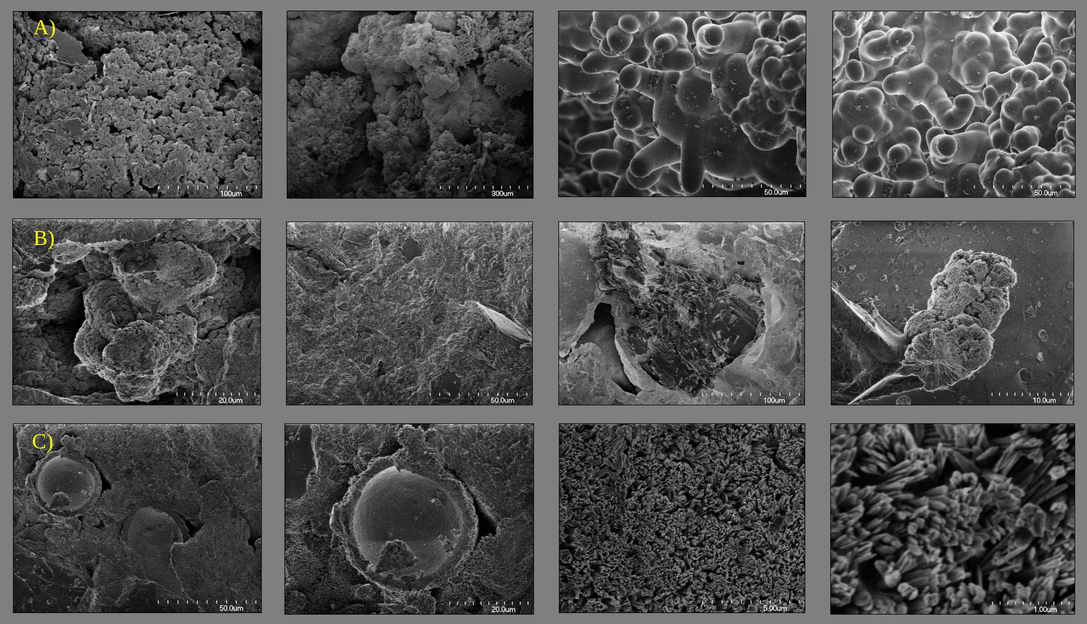


Area Overview

The concretions are found along the Ecleto Creek in Southern Texas, roughly 20 miles south of Seguin. The concretions are found in the Reklaw formation, with some apparent input from the Wilcox Formation. The concretions were found along the cut bank side of the creek. Erosion from rains and water flow exposed these magnificent sediment build ups.
The Reklaw Formation (Er), part of the Claiborne Group; the relative age of this unit is Eocene at 56 – 33.9 Ma. The lithology consists of mostly sandstone and small amounts of clay and mud. Other elements within the unit include fine to medium grained hematite, muscovite and glauconite; it weathers moderate brown and dark yellowish orange with a thickness of 15 – 25 meters.
The Carrizo Sands (Ec), part of the Wilcox Group have a relative age of Late Paleocene to Early Eocene at 59.2 – 47.8 Ma. The lithology consist of mostly sandstone and minor sand, clay, and mud. Other elements consist of medium to very coarse grained, poorly sorted, noncalcareous, light yellow to orange and brown; weathers yellow brown, with local iron-oxide banding; thickness 30.5 – 42.5 meters.



This image shows the cross-section of the main concretion from which the samples were taken. The boxed images around this main image include close ups of the fragments of each of the main locations of interest and sub-sample locations. Associated with these close up images includes a corresponding thin section image. 1) Enlarged images show the distinguishing layers from the shell to the center. The thin section reveals a calcite grain with angular quartz grains surrounding it. 2) Cross-section view of the shell. Thin section displays microcline grain and inclusion quartz grain. 3) The outer most part of the shell of the concretion. Thin section displays quartz compaction with glauconite cement build ups. 4) This displays the inner most part of the shell. Thin section reveals quartz crystals surrounding an altered feldspar grain. 5) Cross-section displaying the alternating layers. Thin section shows muscovite mica is present throughout the darker layers. 6) Main focus is the light brown-orange bean shaped layer. Thin section shows a group of zircon crystals.



SEM and XRD Results

The preliminary results of the Scanning Electron Microscopy (SEM) show a variety of interesting features. Row A are sub-samples obtained from sample 1. The SEM images appear to be amorphous iron oxide, with smaller pieces of clay minerals on the surface. These images were taken from the "bean-shaped" layer that can be seen in image number 6 above. Row B, sample number two, the primary focus was to view the darker red layer, as seen in image number 1 above. Row C, sample number three, displays a spherulite feature coated in what appears to be amorphous iron. Theses images were taken from the orange to brown layer that is best viewed in image number 3 above. Last two images on this row show aragonite crystal growth.
Preliminary X-Ray Diffraction (XRD) gave values of 89.6% quartz, 7.7% clay minerals, 1.8% Aragonite, and 0.9% amphiboles.

Rock Unit Descriptions

The main components of the concretions are found within the Reklaw Formation, with influence from the Wilcox Formation upstream. Both units have similar qualities of minerals present. There are seven distinguishable layers between the outer shell of the concretions to the inner cavity. The layers are distinguished based on the alternating colors between a light brown to the darker color of dark red.

Distinguishing Layers:

Outer most part of the shell:
- 40 - 50% porosity
- Glauconite cement build-ups
- Predominately quartz grains
- Some biotite mica grains

Darker Red Layers:
- 40 - 50% porosity
- Glauconite and unknown cement build-ups
  - Unknown cement created darker coloring
- Predominately quartz grains
  - Shocked quartz possible
- Some biotite mica grains present
- Spars microcline/feldspars

"Bean" shaped layer:
- 40- 50% porosity
- Orang-ish color in zoomed images
- Zircon crystals
  - ~0.25-0.50 mm

Orange Layers:
- 40 - 50% porosity
- Predominately quartz grains
  - Shocked quartz present within these layers
- Spars Chondrules found

Future Research

In order to further this research project, dating the Zircon crystals could determine the relative timing and age for the potential source. Additionally, the presence of shocked quartz found within the crystals is consistent with localized aerial impacts, the exact locations of which have most likely been eroded away over time or covered with sediment, this should be further investigated.

References

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