Chert Sequences on Shelf Margin in Southeast Kansas and Southwestern Missouri

Panel 2 Overview

Four closely spaced (within 10 mi,16 km) P&M (Gulf) cores are used to characterize porous chert-bearing sequences that comprise the shelf margin facies that reside along the southern edge of the Mississippian shelf in southeastern Kansas. Sequences are nearly identical to the depositional and diagenetic fabrics observed in shelf margin strata located 200 miles west in the Tjaden core (***See core description in Poster #1***). The primary difference between the rocks are notable indications of hot, metaliferous fluids that have passed through the rocks in the P&M cores. All cores contain scattered calcopyrite, coarse baroque (high temperature) dolomite, and black aphanitic mineralization. In contrast, chert in western Kansas is gas or oil bearing, but both settings indicate close linkage to basinal fluid migration. Dating methods have yet to be applied to understand the relationships between the age, duration, and regional correlation of these depositional sequences.

P&M 12 Core Description

The description of the P&M 12 corehole is presented in this panel to illustrate the chert sequences, lithofacies, sequence boundaries (---------), and flooding surfaces (--------) so that they can be compared to the chert sequences in the Tjaden core. Sequences have yet to be correlated.

The shelf margin facies contrasts sharply with shelf facies developed north and east of this area in northeast Cherokee County from which these cores are located (***see index map below***).

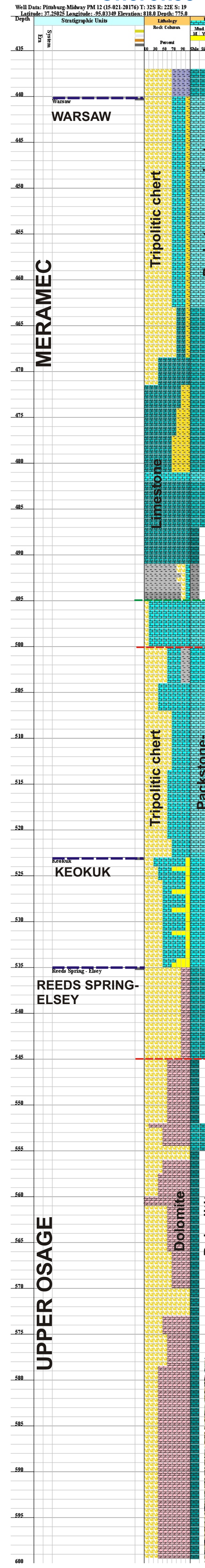
The set of high-frequency, meter-scale depositional sequences is apparently absent or not well defined in the corresponding shelf deposits. Specifically, the adjoining shelf deposits have varying amounts of nodular, dense chert, but do not contain significant amounts of the white, microporous, massive, brecciated chert beds that typify the shelf margin facies. Also, the shelf deposits have abundant encrinitic limestones, which are limited to thin (<3 ft, 1 m) intervals in the shelf margin facies. The shelf margin facies also contains fossiliferous dolosiltites, which are sparse to absent in the shelf facies. Likewise, the dark shales and chert beds are for the most part lacking in shelf deposits. Lastly, but notably, **lateral changes in facies appear to be considerably more rapid in the shelf margin facies leading to stratal pinchouts/truncation, most importantly, highly porous tripolitic/microporous chert beds. Also these changes appear to be affected by local, contemporaneous structural deformation along the lower shelf and shelf margin, probably linked to tectonism associated with the convergent plate boundary immediately south (*see paleogeography in Panel 1*).**

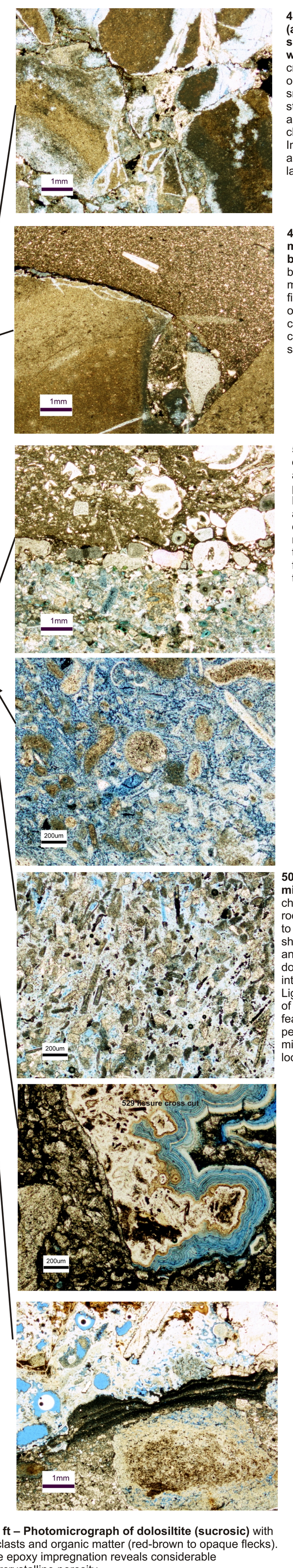
Wireline Log Cross Section (below) –

Widespread chert accumulation along the shelf margin comprised poorly defined and uncorrelated apparent high-frequency cycles that may present depositional sequences. Petrophysical logs, particularly log suites including spectral gamma ray (Th-thorium, U-uranium, and K-potassium) may be helpful in correlating depositional sequences defined in cores and related chemostratigraphy that are planned in future work. A draft cross section ties the chert sequences in the Tjaden core, located in south-central Kansas, with the P&M cores in southeastern Kansas. (***Cross section is located at the bottom of this panel***.)

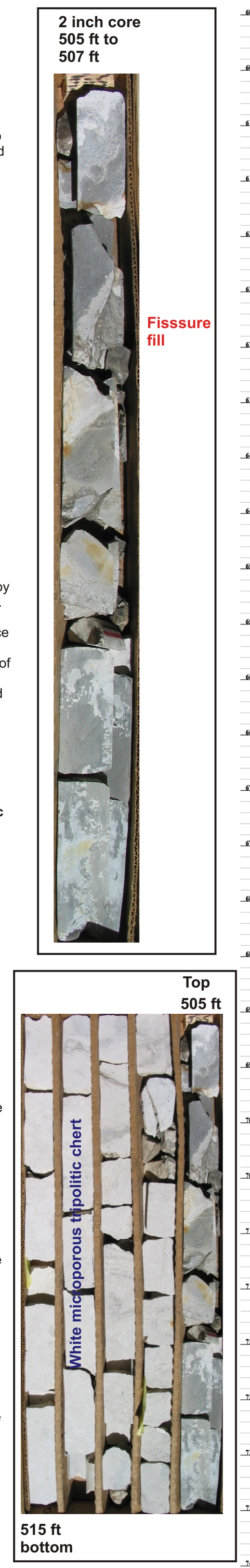
Location of corehole, P&M #12 – described to the right

Core P&M #12 (upper half)
Township 32S-Range 22E-Section 19
Cherokee County, Kansas

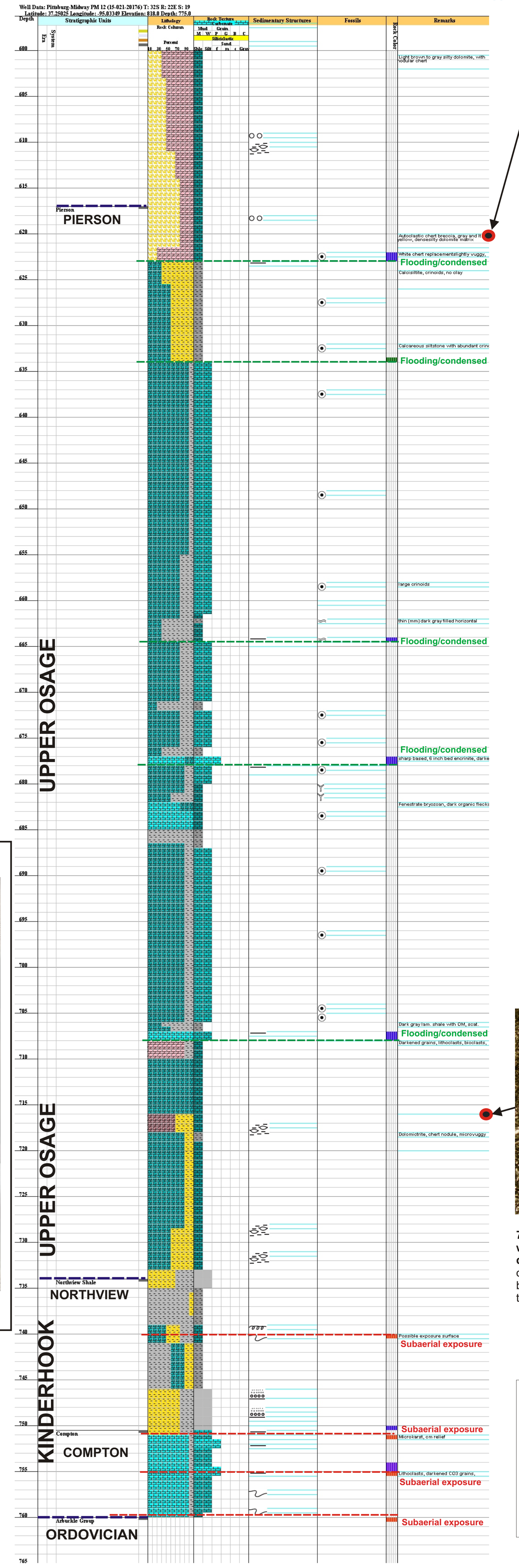




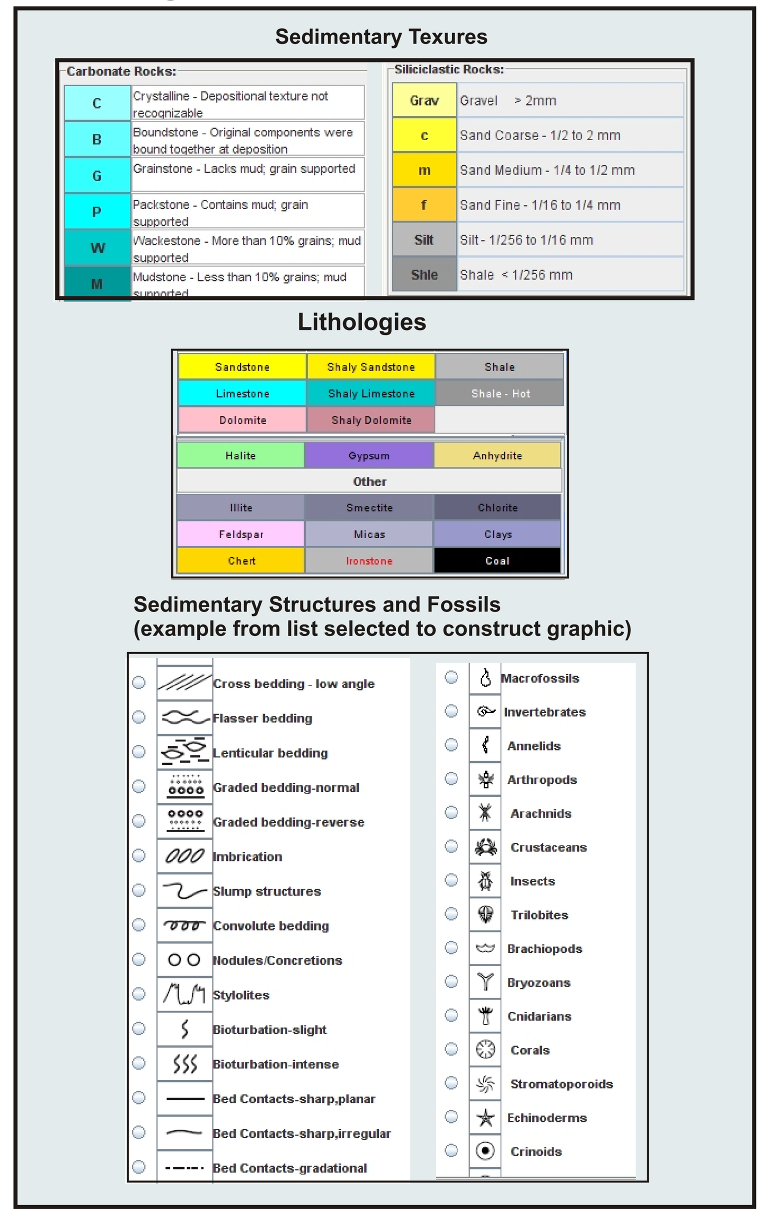
582 ft dolosiltite with bioclasts and organic matter



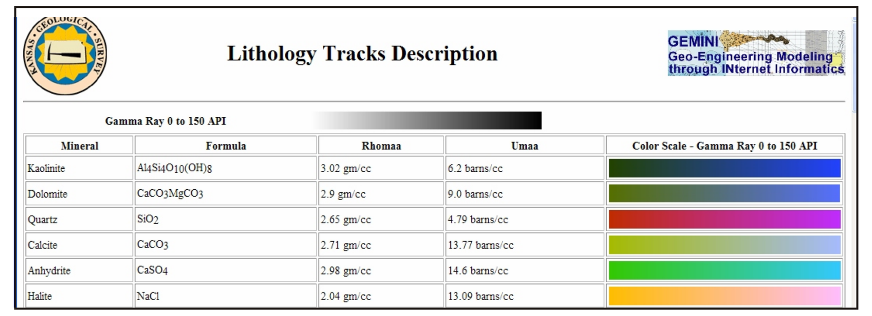
Core P&M #12 (lower half continued from left side))

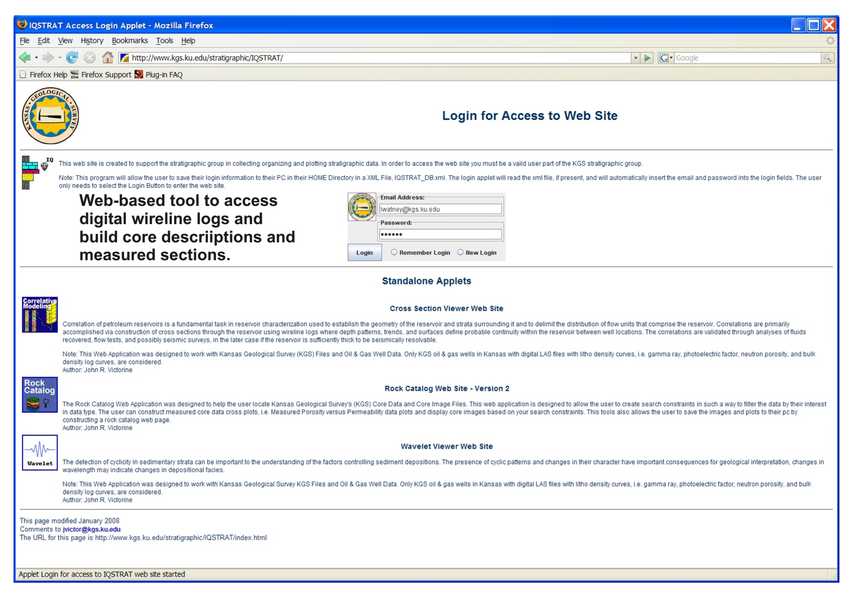


Legend for core description

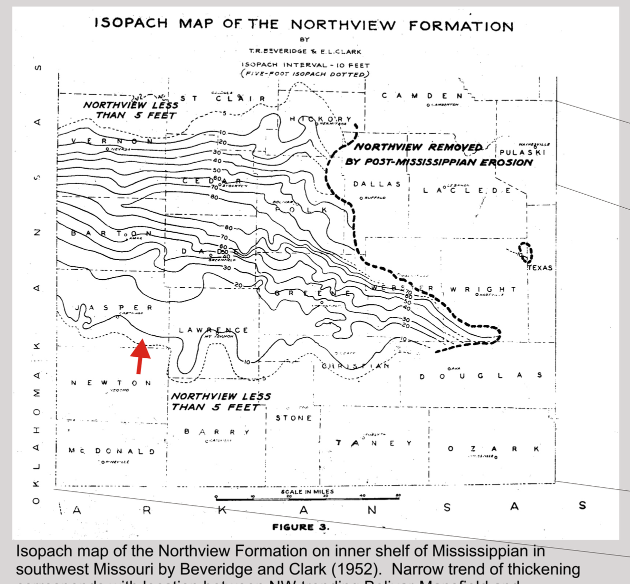


Legend for color imaging of wireline logs in cross section below to aid in identifying stratigraphic successions





Influence of contemporananeous structural deformation (differential subsidence and faulting) on Mississippian deposition.



Isopach map of the Northview Formation on inner shelf of Mississippian in southwest Missouri by Beveridge and Clark (1952). Narrow trend of thickening corresponds with location between NW-trending Bolivar-Mansfield and Chesapeake faults. Red arrow in this figure shows approximate location of Sac River Fault and photo below.

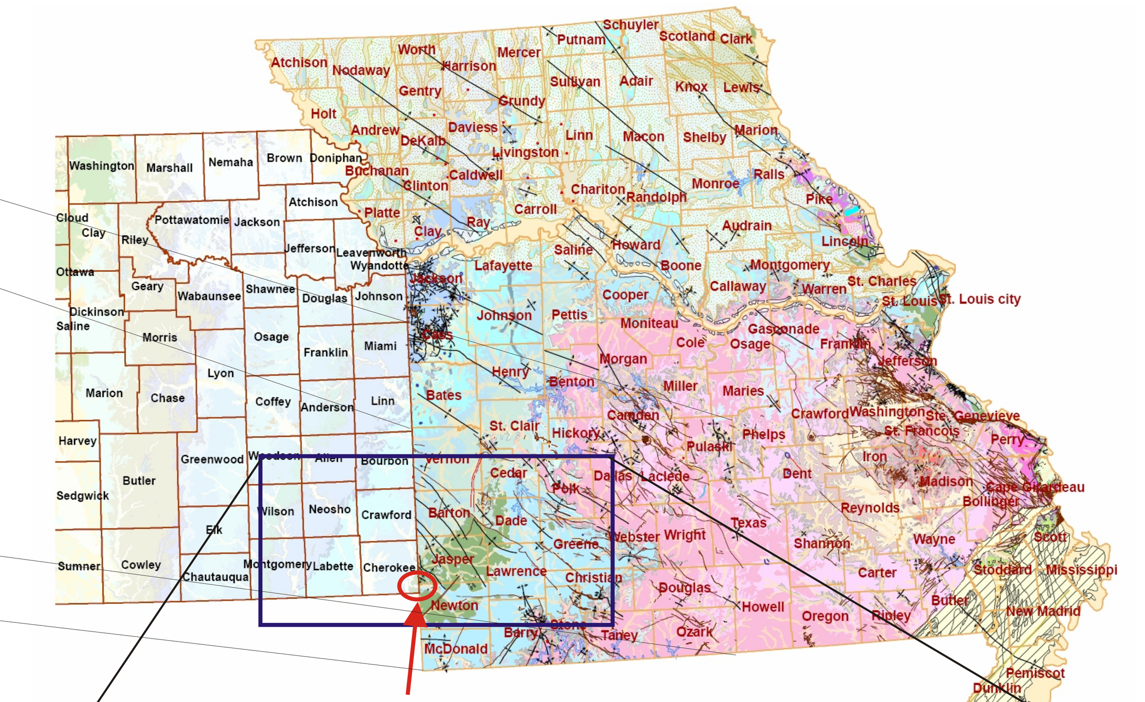
Preliminary examination of an surface exposure with an abrupt change in bedding in the Keokuk Ls. located adjacent to the west edge of a series of four closely-spaced (within ~50 ft, 15 m) *en echelon* faults (associated with the Sac River Fault) exposed along mile marker 27.2 on I-44 approximately 55 mi (89 km) west of Springfield, Missouri (May 20, 2007 field trip) **(See location in map above)**.

Red dashed arrow (----->) identifies a pinchout of encrinitic limestone unto a dense silicified carbonate bed. Capping the exposure is the massively bedded Short Creek Oolite. It and the underlying wavy bedded unit continue uninterrupted over the pinchout and chert bed. The Short Creek Oolite is a key marker in the region separating the Osagean from the overlying Meramecian, the base of which appears to be a subaerially exposed surface based on core data.

The truncation beneath the Short Creek Oolite suggests local contemporaneous structural movement, perhaps in conjunction with the fault zone. A breccia zone, covered along right side of photo, also suggests movement along the fault zone. Surface exposures such this will probably serve as useful analogs to better understand the influence of margins of subsurface fault-bounded areas on sedimentation.

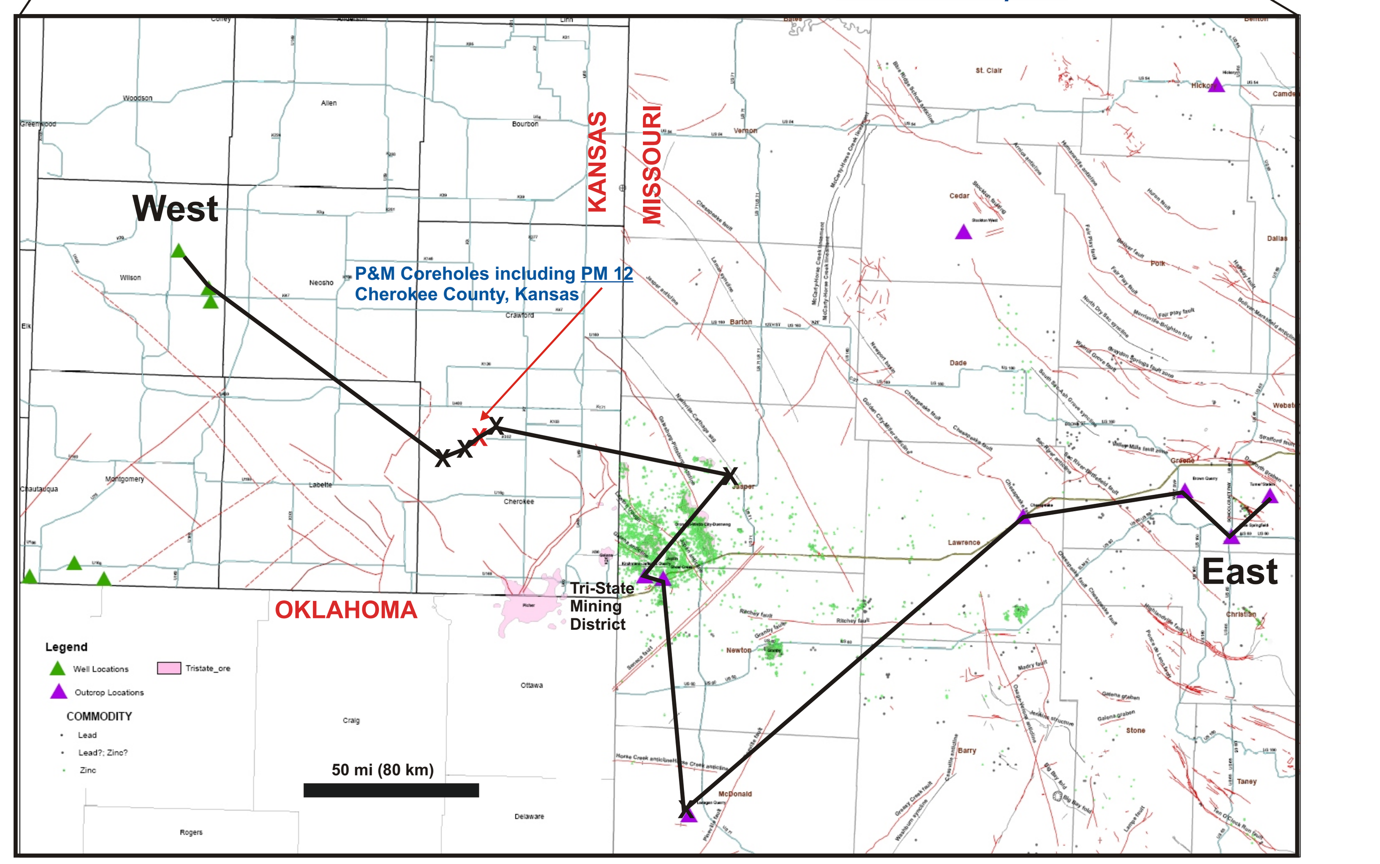
Surface Geology and Structures in Eastern Kansas and Missouri – Index Map for Cross Section on Panel 3

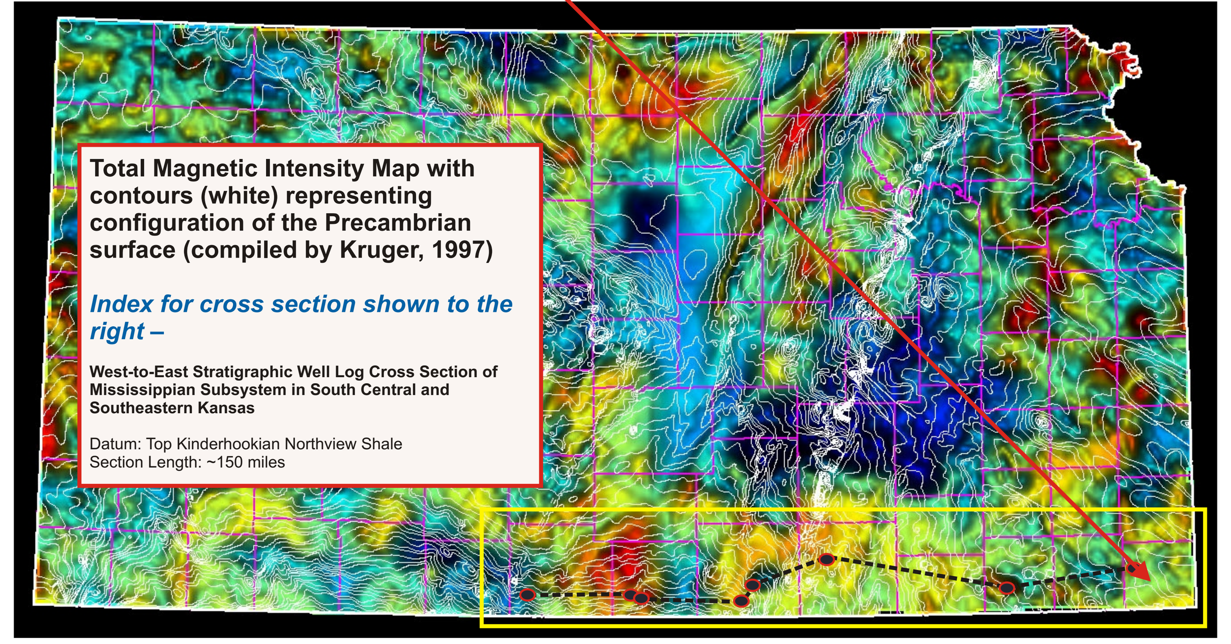
Surface structures on bedrock geologic map of Missouri and eastern Kansas. Many faults noted on pre-Pennsylvanian surface exposures in Missouri some of which apparently were active during deposition as evidenced by lithofacies pattern and thickness changes.



Tri-State Mining District

Structural Elements with Index for Cross Section *shown in next panel*





Core, cuttings, and wireline logs define apparent high-frequency, yet uncorrelated depositional events (*denoted as marker horizons*). Where core are available, some of these high frequency events have been verified as unconformity-bounded depositional sequences. Cross section follow the strike of the lower-shelf and shelf-margin chert-bearing Osagian and lower Meramecian strata. Note the considerable lateral variation in lithofacies successions, believed to represent well locations along varying proximal and distal positions of the shelf margin, probably comprised of non-correlating, often temporally-distinct progradations.