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(5/09)
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ATTACHMENT 3
U.S. Department of Energy
FEDERAL ASSISTANCE REPORTING CHECKLIST AND INSTRUCTIONS

1. Identification Number:	2. Program/Project Title:
DE-FE0004566	"Prototyping and testing a new volumetric curvature tool for modeling reservoir compartments and leakage pathways in the Arbuckle saline aquifer: Reducing uncertainty in CO2 storage and permanence"

3. Recipient:
University of Kansas

4. Reporting Requirements:		Frequency	No. of Copies	Addresses
A. MANAGEMENT REPORTING				
☒ Progress Report		Q	Electronic Version to NETL>	***FITS@NETL.DOE.GOV***
☒ Special Status Report		A		
B. SCIENTIFIC/TECHNICAL REPORTING * (Reports/Products must be submitted with appropriate DOE F 241. The 241 forms are available at https://www.osti.gov/elink)				
Report/Product	Form			
☒ Final Scientific/Technical Report	DOE F 241.3	FG	Electronic Version to E-link>	***http://www.osti.gov/elink-2413***
☒ Conference papers/proceedings/etc.*	DOE F 241.3	A		***http://www.osti.gov/elink-2413***
☐ Software/Manual	DOE F 241.4			***http://www.osti.gov/estsc/241-4pre.jsp***
☒ Other (see special instructions)				
Topical	DOE F 241.3	A		
** Scientific/technical conferences only*				
C. FINANCIAL REPORTING				
☒ SF-425, Federal Financial Report		Q, FG	Electronic Version To NETL>	***FITS@NETL.DOE.GOV***
D. CLOSEOUT REPORTING				
☒ Patent Certification		FC	Electronic Version To NETL>	***FITS@NETL.DOE.GOV***
☒ Property Certificate		FC		
☐ Other				
E. OTHER REPORTING				
☒ Annual Indirect Cost Proposal		A	Electronic Version To NETL>	***FITS@NETL.DOE.GOV***
☒ Annual Inventory Report of Federally Owned Property, if any		A		
☐ Other				
F. AMERICAN RECOVERY AND REINVESTMENT ACT REPORTING				
☐ Reporting and Registration Requirements				***http://www.federalreporting.gov***

FREQUENCY CODES AND DUE DATES:

A - As required; see attached text for applicability.
FG - Final; within ninety (90) calendar days after the project period ends.
FC - Final - End of Effort.
Q - Quarterly; within thirty (30) calendar days after end of the calendar quarter or portion thereof.
S - Semiannually; within thirty (30) calendar days after end of project year and project half-year.
YF - Yearly; 90 calendar days after the end of project year.
YP - Yearly Property - due 15 days after period ending 9/30.

5. SPECIAL INSTRUCTIONS:

- The **forms identified in the checklist are available at DOE Financial Assistance Forms Page. Alternate formats are acceptable provided the contents remain consistent with the form.**
- **See Federal Assistance Reporting Instructions on the following page.**

QUARTERLY PROGRESS REPORT

Award Number: DE-FE0004566

Recipient

University of Kansas Center for Research and
The Kansas Geological Survey
1930 Constant Avenue
Lawrence, Kansas 66047

Title

"Prototyping and testing a new volumetric curvature tool for modeling reservoir compartments and leakage pathways in the Arbuckle saline aquifer: reducing uncertainty in CO_2 storage and permanence"

Project Director/Principal Investigator: Jason Rush
Joint Principal Investigators: Jason Rush/Lynn Watney

3rd Quarter Progress Report

Date of Report: 7/29/2011

Authors: Jason Rush and Lynn Watney

Period Covered by this Report: April 1, 2011 through June 30, 2011

Executive Summary

The contract for the project, "*Prototyping and testing a new volumetric curvature tool for modeling reservoir compartments and leakage pathways in the Arbuckle saline aquifer: reducing uncertainty in CO_2 storage and permanence*," was signed with U.S. DOE on October 1, 2010. The project is collaboration between the Kansas Geological Survey (KGS) and its industry partner MVP LLC (a partnership between Murfin Drilling Company and Vess Oil Corporation). The project study area is located in Ellis County, Kansas (Figure 1).

A 90-day no-cost extension was granted for the project to accommodate: (1) prolonged negotiations with our industry partner and other companies regarding use of jointly held proprietary seismic data; (2) subsequent velocity modeling complications; and, (3) resignation of the project's joint-PI. As of the end of this reporting period, sub-tasks for the 3rd quarter milestones are partly complete. Remote sensing and gravity-magnetic interpretations are complete. Single trace and multi-trace seismic attribute analysis is ongoing. Anticipated results include (1) paleokarst facies and (2) porosity attribute volumes (in depth) that can be used as secondary trends during facies and porosity modeling processes. The Bemis-Shutts' 3D seismic volumes have now been successfully merged, reprocessed, and depth-converted. Horizon interpretation is also complete. Decision Point 1 is associated with the completion of these subtasks. The Go/No Go decision is based upon whether or not features exist within the seismic volume that are indicative of Arbuckle paleokarst (official evaluation will be delivered to DOE Project Manager as a separate document).

The PSDM volume reveals multiple locations having 3D-geometries consistent with paleokarst. Numerous, through-going, near-vertical karst collapse features originate in the lowermost Arbuckle and extend to the base of the clastic Simpson section. The Simpson section expands across sags (~1000-ft in diameter) developed along the Arbuckle unconformity suggesting an antecedent topography consistent with karst terrains. The geometries and physical dimensions seen in the seismic are consistent with age-equivalent karst observed in outcrop. Knowledge of the vertical extent and transmissibility of paleokarst features is critical for accurately modeling the hydrodynamic architecture, estimating sequestration capacity, and ascertaining potential CO_2 leakage pathways within the Arbuckle saline aquifer.

Volumetric curvature (VC) attributes have also been processed and results include four different interpretations. This processing was performed on both the PSTM and PSDM volumes. Pre-spud static geologic models and simulation scenarios will incorporate these different interpretations as distinct cases. This data and the PSDM interpretation will provide spatial constraints on reservoir boundary conditions during simulation. We presume that paleokarst boundaries—identified by VC analysis—will strongly impact simulation-based history matching and pre-spud forecasting of the planned horizontal lateral that will target VC-interpreted reservoir compartments.

As stated earlier, a no cost extension was granted to the project. These additional three months will provide time to integrate VC attributes, complete saturation modeling, perform simulation modeling, and locate, drill, and log horizontal Test Borehole #1 prior to January 2012.

DISCUSSION
Approach:
Results from the gravity-magnetic processing have been delivered. These data were subjected to tilt angle analysis for resolve location of discontinuities/contacts suggested by the gravity data and the depth to these anomalies (Figure 2). The tilt angle is defined as the arc tangent of the ratio of the 1st-order vertical derivative by the 1st-order horizontal derivative of the Bouguer anomaly.

The tilt angle is the angle between the vertical and horizontal derivatives of potential fields (*M*, magnetic or gravity). The tilt angle (θ) can identify the location and depth (half the physical distance between +-45° contours) of contact–like structures (Miller and Singh, 1994).

$$\theta = \tan^{-1}\left[\frac{\partial M}{\partial z} \Big/ \frac{\partial M}{\partial h} \right]$$

The workflow involves using the raw gravity data, obtaining a topographic correction, applying a band-pass filter to examine different frequencies and therefore depth, and finally running directional derivatives and obtaining tilt angle for different depths (Figures 3-.

Hedke-Saenger Geoscience, Ltd, a subcontractor in this project, has been contracted to provide analysis of seismic data in the vicinity of the southern limits of the Bemis-Shutts Field in Ellis County, KS. They have coordinated the acquisition of existing seismic data from different donors and in merging several 3D seismic volumes. Lockhart Geophysical acquired the Bemis-Shutts survey in 2006 on behalf of MVP LLC. Sterling Geophysical managed, designed, processed, and interpreted the original data set. Sterling Geophysical also managed, designed, processed, and interpreted the Noble Energy survey acquired over the Baumer Lease adjacent to the Bemis-Shutts survey. Sterling Seismic was contracted to reprocess and merge the volume as pre-stack time migrated (PSTM) and pre-stack depth migrated (PSDM) solutions. Hedke-Saenger has completed the PSTM analysis, and has delivered depth converted structural surfaces at the Base Anhydrite, Heebner Shale, and Arbuckle horizons. This procedure involved picking these events in the PSTM volume, incorporating all available well control to produce a velocity function, ultimately generating PSTM-based depth surfaces at each horizon (Figure 3). The final PSDM volume was delivered earlier this quarter. The generalized workflow for the PSDM volume is outlined below:

- Process data processing to merge prior volumes, yielding Pre-Stack Time Migrated (PSTM) solution
- Interpret PSTM data on multiple horizons
- Integrate PSTM horizons and well control data to produce horizon-based depth conversions
- Achieve Pre-Stack Depth Migration using PSTM volume as input
- Map each horizon in the PSDM volume

- Use PSDM picks to calibrate / register the PSDM volume
- Calculate horizon by horizon comparisons / differences

Volumetric curvature attributes were generated for both the PSTM and PSDM volumes and provide the resolution necessary for mapping reservoir compartmentalization, deep-seated fracture systems, and other issues potentially related to subsurface flow regimes. Four different VC results were provided to the KGS by Geo-Texture. For typical curvature processing, Geo-Texture will produce results at two or three lateral resolutions to help image structures of different sizes. Input data is also conditioned using a principal component analysis (PCA) technique, which removes noise while preserving or enhancing signal. Principal component analyses use a small sub-volume of data, which includes multiple traces, in order to separate noise from signal. Such a multi-trace operator may smooth out faults and otherwise alter subtle structure, but Geo-Texture software contains algorithms to prevent or minimize over-smoothing. During evaluation of the data, Geo-Texture discovered that there were no obvious patterns in the data, so the data was reprocessed with PCA operators of larger lateral extent at the risk of altering subtle structure. Results from multiple processing are shown in Figures 4-20. These additional data sets were also provided by Geo-Texture. Detailed interpretation of the processed volumetric curvature attribute results is ongoing. Research results should resolve which conditioning function is most appropriate.

Susan Nissen, who will provide the 3D seismic VC interpretations for this project, recently described its utility for assessing candidates for CO_2 sequestration (Nissen et al., 2009). Curvature describes how bent a surface is at a particular point and is closely related to the second derivative of the curve defining the surface (Nissen et. al., 2005) The more bent a surface is, the larger its curvature. In two dimensions, positive curvature refers to an antiform feature, negative curvature refers to a synform feature, and zero curvature refers to a planar feature. In three dimensions, there are numerous curvature measures that can be extracted, related to the direction of the plane along which curvature is measured. VC attributes have been shown to reveal useful information relating to folds, faults, and lineaments contained within the surface (Roberts, 2001). Most published work of curvature analysis applied to 3D seismic data has been limited to calculations based on gridded interpreted horizons (e.g., Hart et al., 2002; Masaferro et al., 2003; Sigismondi and Soldo, 2003). However, recently, a suite of VC attributes has been developed, where reflector curvature is calculated directly from the seismic data volume, with no prior interpretation required (al Dossary and Marfurt, 2005). Of the numerous volumetric curvatures calculated, the most positive and most negative curvatures, which measure the maximum positive and negative bending of the surface at a given point, are the most useful in delineating faults, fractures, flexures, and folds (Al-Dossary and Marfurt, 2005; Blumentritt et al., 2003, 2005; Serrano et al., 2003; Sullivan et al., 2003, 2005). The most negative curvature volume appears to be the best for viewing fractures.

There are several ways that fractures could cause negative bending of a seismic horizon. One possible explanation is that the fractures are open and locally decrease the average velocity of the rock. Another possibility is that the fractures are filled with a lower velocity material, such as shale. Curvature has proven to be useful in identifying fractures that cannot be identified with conventional 3-D seismic attributes, including coherence. This is because fractures or small-offset faults (with offsets less than one- quarter wavelength) will not cause a break in the seismic reflector, and are thus not detectable by coherence. However, subtle flexure along horizons related to karst-induced sagging and bed-limited fault offset can be detected by VC analysis techniques.

Well and lease level production and pressure data are being acquired from the files of the operating companies to generate production and pressure histories consistent with input requirements of the reservoir simulator (CMG suite). John Doveton (KGS petrophysicist) is developing rock fabric-water saturation functions that will be used to produce facies and water saturation models. Jianghai Xia has generated gravity-magnetic maps centered on Bemis-Shutts using the tilt-depth method (Figure X). Dave Koger has completed remote sensing interpretations of the Bemis-Shutts area.

Results and discussion:
Interpretations of gravity-magnetic and remote sensing results have not yet been completed.

The final PSDM volume was delivered earlier this quarter. The difference at the top Arbuckle is approximately +/- 10 feet using velocity functions alone. However, due to different surface modeling algorithms the difference between the Sterling-generated top Arbuckle and Petrel™-generated is much greater where coincident with flexures (Figure 21). An interval velocity volume was also provided by Sterling and will be used in Petrel™ to directly depth-convert the PSTM volume. This will ensure that the various attribute volumes utilized during property modeling will have the same consistent grid location as the structural/stratigraphic model.

Sagging reflectors within the Arbuckle are seen throughout the merged PSDM volume (Figure 22). The top Arbuckle records the super-sequence scale, Sauk-Tippecanoe unconformity. Throughout the USA, this unconformity records some of the most vertically and laterally extensive karst features known. Stratigraphic correlations, cores, bit drops, and production data indicate that the top Arbuckle is extensively karsted. The reprocessed seismic from Bemis-Shutts also indicates pervasive karst features. The deepest karst collapse features appear to be coincident with long-lived basement-involved faulting. Amplitude anomalies above inferred Arbuckle paleokarst may reflect long-term and ongoing basement failure and upward propagation of fault/fracture systems that could function as CO_2 leakage pathways. However, the presence of Arbuckle hydrocarbons indicates that such through-going faults frequently seal.

Conclusions:
Results from the seismic interpretation are encouraging. Seismic and volumetric curvature geometries are consistent with Arbuckle karst. These features are not simply processing artifacts or seismic anomalies as measured in two way travel time. Such geometries still persist in the PSDM volume that has been tied to well control (Figure 23). Thus, the selected study area should provide an ideal setting to test the utility of seismic volumetric curvature for identifying prospective paleokarst compartments. Remote sensing, potential fields, seismic interpretations, and VC interpretations will all be integrated into the geocellular reservoir modeling project, so that all data and interpretations can be synthesized and critically evaluated within a comprehensive 3D earth model.

An official letter will be submitted on August 1, 2011 to the DOE project manager recommending that the project move forward past Decision Point 1. A meeting with our industry partner Vess will be scheduled for early August to present results of the seismic interpretation, including VC analysis, and to select a drilling location for the horizontal test boring. NEPA forms will be submitted and the operator will submit documents to KCC for legal permitting. After agreement with Vess and our DOE Project Manager, wells that offset the selected test boring location will be simulated and history matched prior to drilling.

Cost Status

Please refer Attachment 1

Schedule/Milestone Status

Please refer Attachment 2

Data confidentiality agreements for project research activities have been obtained from all relevant seismic survey owners. Contract negotiations, related data sharing, and confidentiality agreements have been secured with the various parties. Remote sensing and gravity/magnetic interpretations over the study area have been completed. All modern vintage porosity logs have been integrated into geocellular project. Additionally, work is being done to normalize older neutron count logs. Water saturation estimates and determination of the FWL is ongoing. The final seismic PSDM volume has been delivered. The PSTM and PSDM volumes were processed for VC. VC interpretation is ongoing. Tasks related directly to Milestone 1.3 (i.e., pre-spud simulation) is delayed one business quarter and will commence August 1, 2011.

Changes in Approach or Aims

No changes in approach or aims have been initiated in this project. Current work in the project is following the workflow outlined in the proposal.

Actual or Anticipated Problems

A no-cost extension for BP1 was granted in early July. The project experienced delay related to initial negotiations with our industry partners. Problems related to velocity modeling delayed delivery of the PSDM volume. This was the first PSDM attempt in Kansas by either operators, or consulting geophysicists, so the learning curve was steeper than anticipated. This will provide additional time to fully integrate geocellular model with the various seismic attributes, simulate, and plan and permit the test boring. The horizontal wellbore is now anticipated to spud in October 2011.

The study area, covered by the donated Bemis 3D survey, produces almost exclusively from the Arbuckle. Significant variation in producibility between adjacent leases is attributed to paleokarst heterogeneity. Also, there are significant production histories available for these wells from both public databases maintained at the KGS and also from the files of individual operators. Following the workflow outlined in the proposal, the pre-spud seismic interpretation and volumetric curvature analysis will be integrated with log and core data to develop a reservoir model showing the distribution of the paleokarst compartments. The initial indirect validation of this geomodel will be carried out by history matching the production performance of existing wells located within compartments of interest. The presence of producing Arbuckle wells in the study area will, therefore, be helpful in validating the volumetric curvature tool. Also, the study area is located within an oil producing region of Kansas and so obtaining a drilling permit will be a routine procedure.

Based on preliminary geocellular model and from preliminary interpretation of the reprocessed seismic PSDM volume, the presence of paleokarst compartments in the study area can be inferred. The test borehole #1, to be drilled as part of this project, will be located inside a lease owned and operated by industry partner MVP LLC. Thus, no problems are expected to arise related to obtaining leasing rights to the drilling location. Also, the test borehole will be drilled by Vess Oil Corporation (VOC) - an oil and gas operator with significant drilling experience in Kansas. Additionally, drilling activities and its supervision will be shared between VOC and the KGS where one of the Joint Principal Investigators (Jason Rush) has extensive industry-related experience in designing, drilling, landing, and completing horizontal wells.

Absence or Key Personnel Changes

Saibal Bhattacharya, previous Joint PI, resigned from the KGS in May. Lynn Watney has agreed to assume Joint-PI responsibilities and assist with managerial tasks. A search is underway for a permanent simulation engineer. Gene Williams, a consultant, the principal in Williams Petroleum Consulting in Houston, was contracted to build the series of simulations required for the project. He has considerable experience with CO_2-EOR comes highly recommended by staff at CMG. Mr. Williams comes with the expertise and experience that is needed to fit into the project and no disrupt the workflow.

All other key personnel, as listed in the proposal, continue to work for and are part of this study. No personnel changes are anticipated at this point in time. KGS has also hired undergraduate engineer, Aadish Gupta, whose primary is to coordinate handling of well data and building input data files for geomodels and simulation. Also, Mina Fazelalavi, a graduate engineer from KU to conduct quality control, normalization, and analysis of LAS wireline log files for the DOE projects and to assist in building integrated geomodels suited for simulation.

Technology Transfer

The project website (http://www.kgs.ku.edu/PRS/Bemis/index.html) has been constructed and is available for public access. The project web site will display all results and interpretations obtained from this study and will be maintained by the KGS. Technology transfer activities are anticipated to begin during the final half of the last year, when all data collection has been completed, and analysis, interpretation, and modeling are in progress to demonstrate and validate the feasibility of using volumetric curvature analysis to characterize paleokarst reservoir compartmentalization to better model of CO_2 storage and permanence in saline aquifers such as the Arbuckle in Kansas.

Initial results from the geocellular modeling, the PSDM processing, horizon interpretation, and VC processing will be presented in an oral session to the local community during the Kansas Next Step Oil and Gas Meeting in Russell, Kansas (August 3-4, 2011).

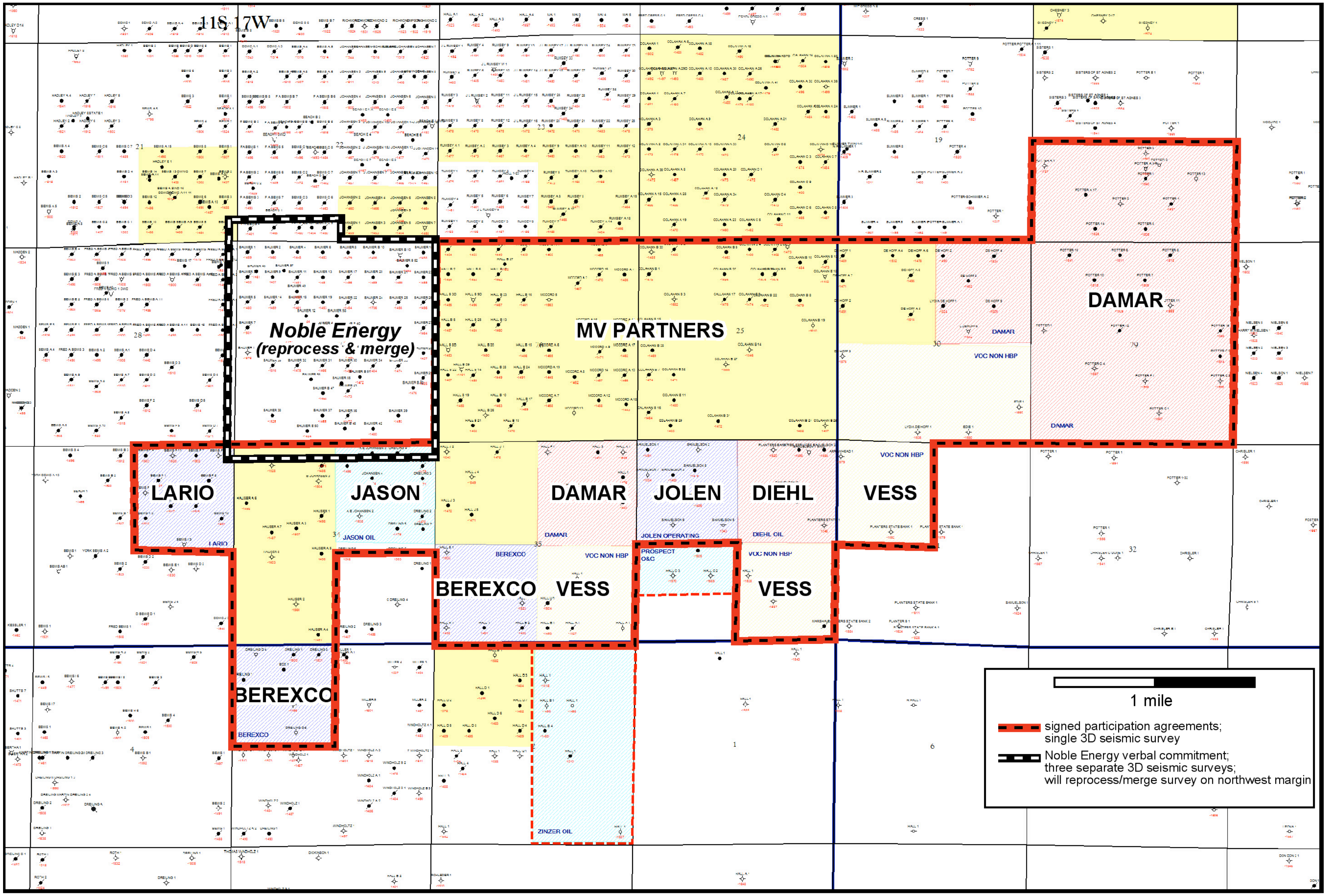

Figure 1. Map of southern Bemis-Shutts showing project area (seismic survey), operators, and merged Noble Energy survey.

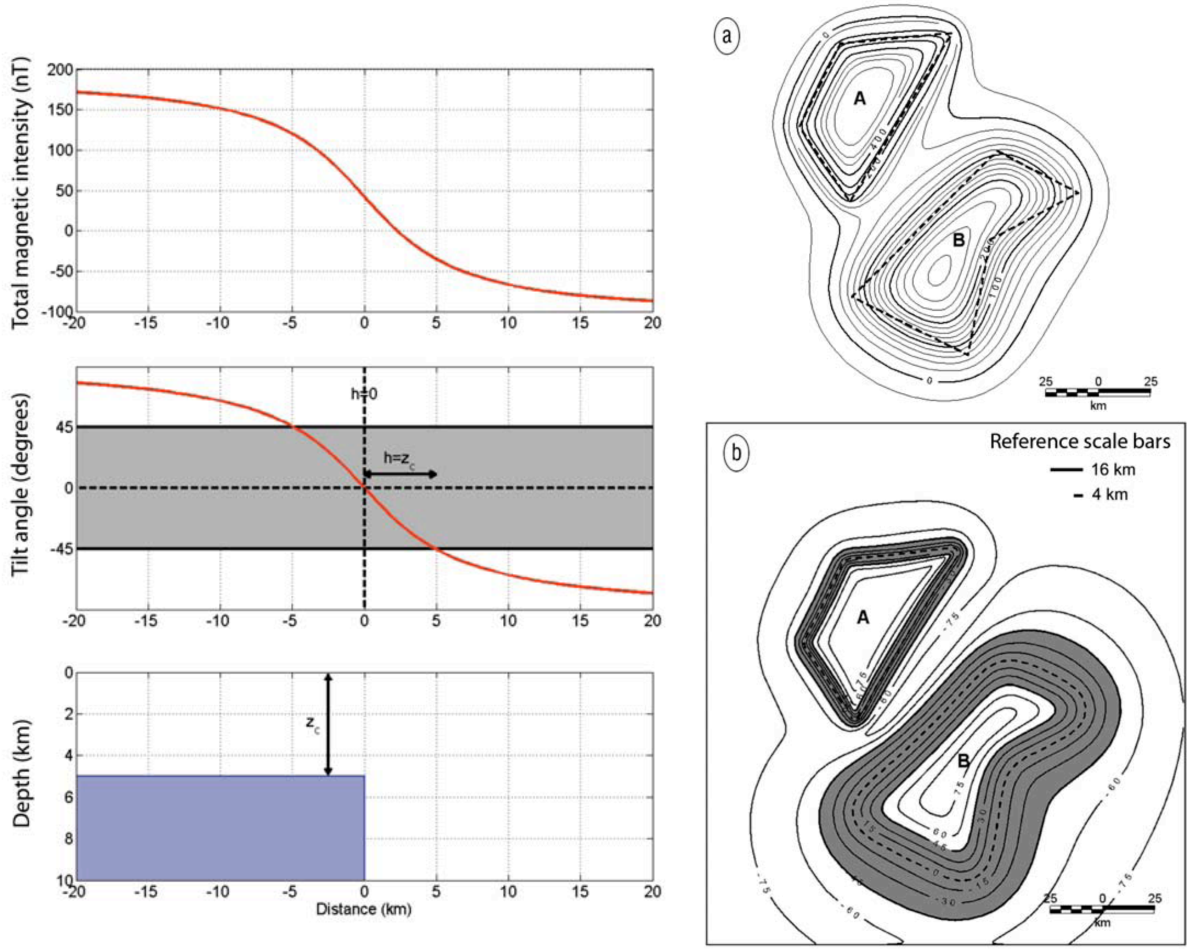

Figure 2. Illustration showing how tilt angle is calculated and resulting body delineation.

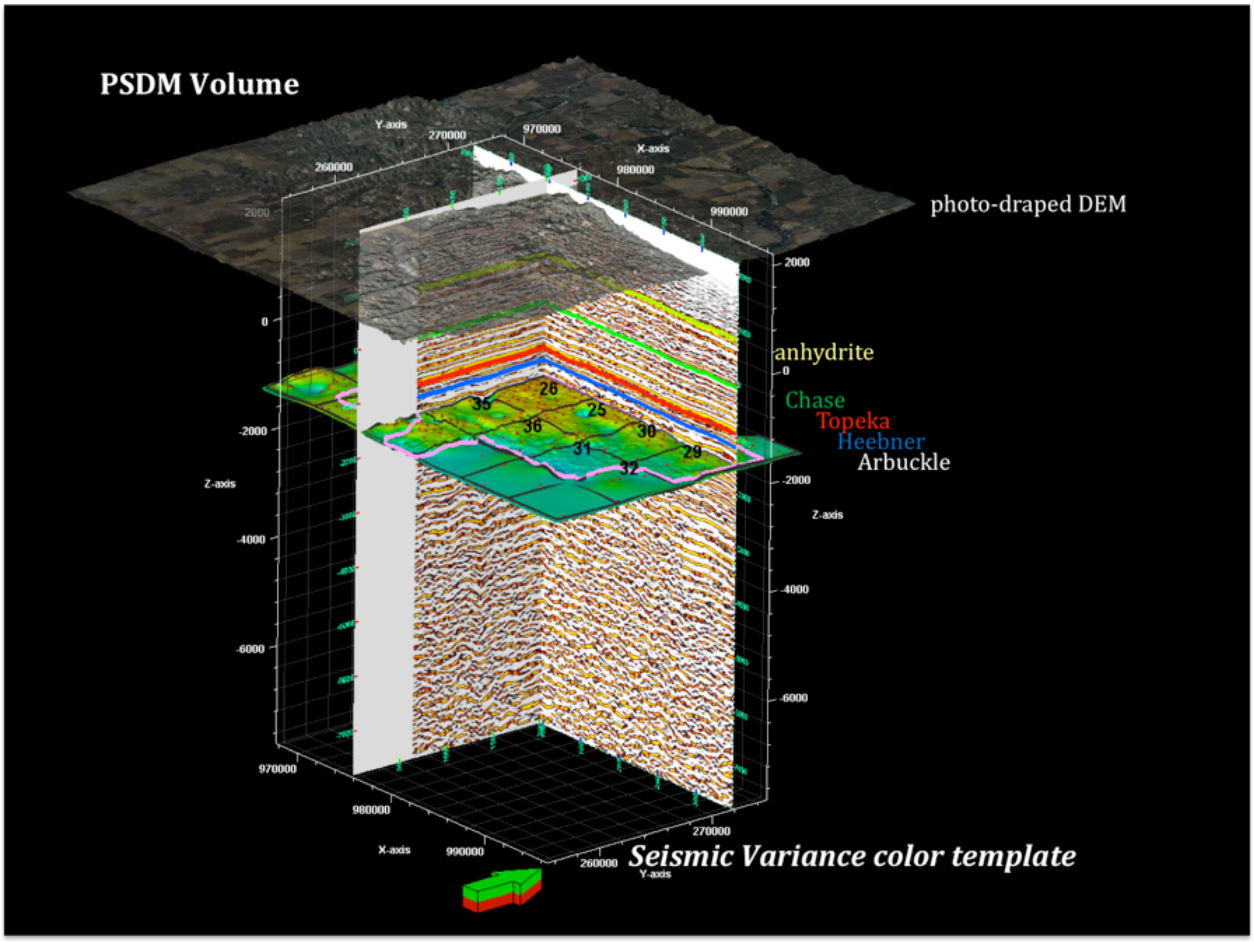

Figure 3. PSDM volume and horizon interpretations in Petrel project.

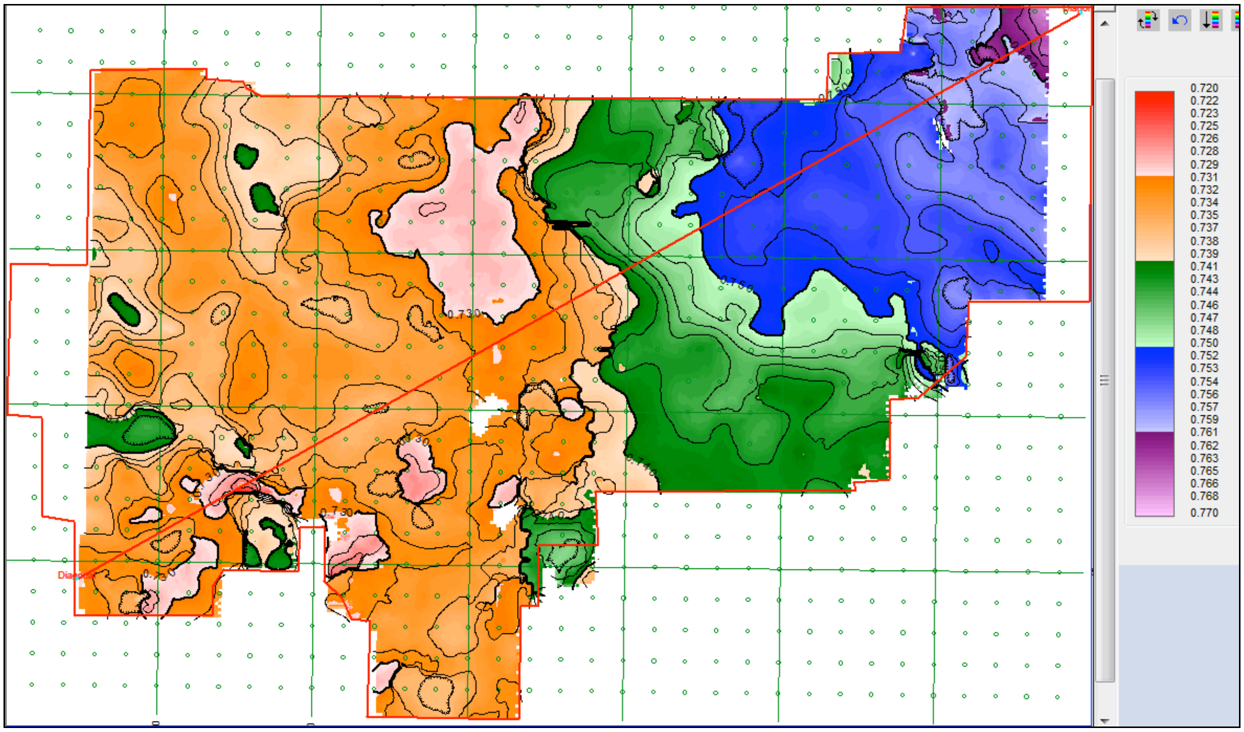

Figure 4. Arbuckle time structure map (PSTM). Red line shows line-of-section used for comparison of different principal component analysis conditioning results and subsequent volumetric curvature attribute volumes.

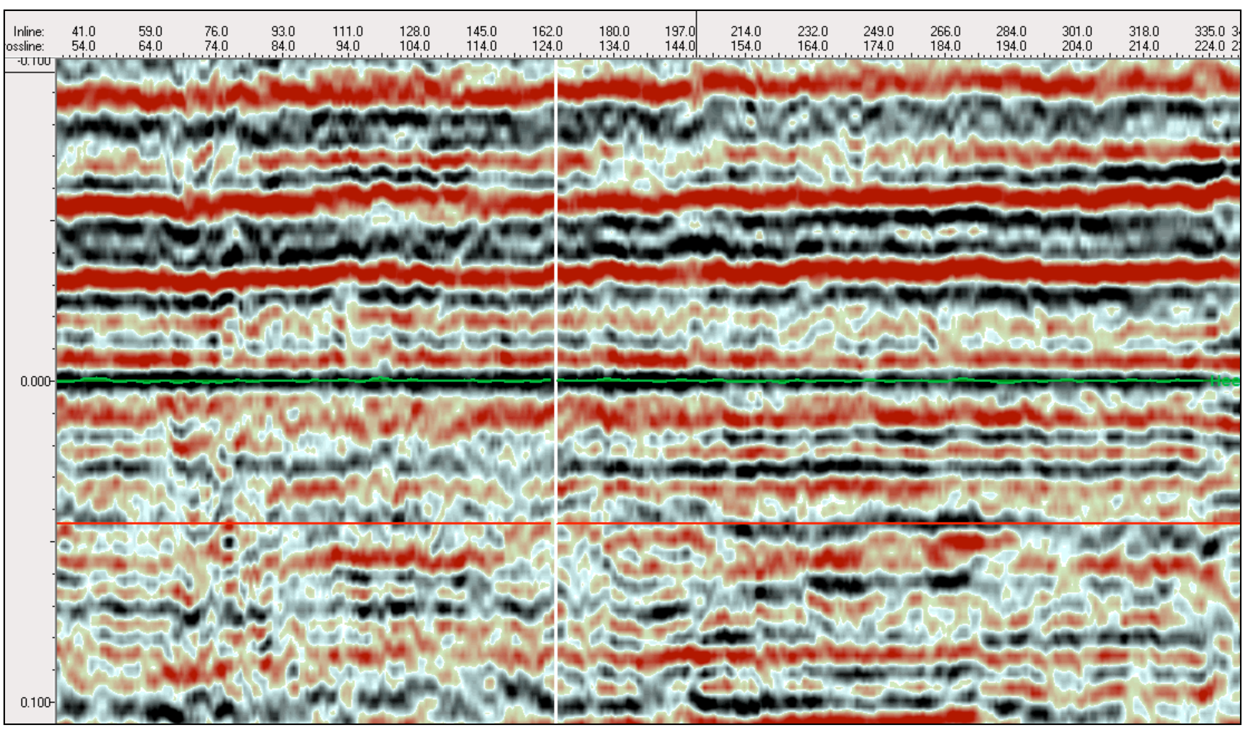

Figure 5. PSTM Seismic line flattened on Heebner without PCA conditioning. In Figures 6-8, PCA conditioning is increased, which results in noise reduction and increased reflector continuity.

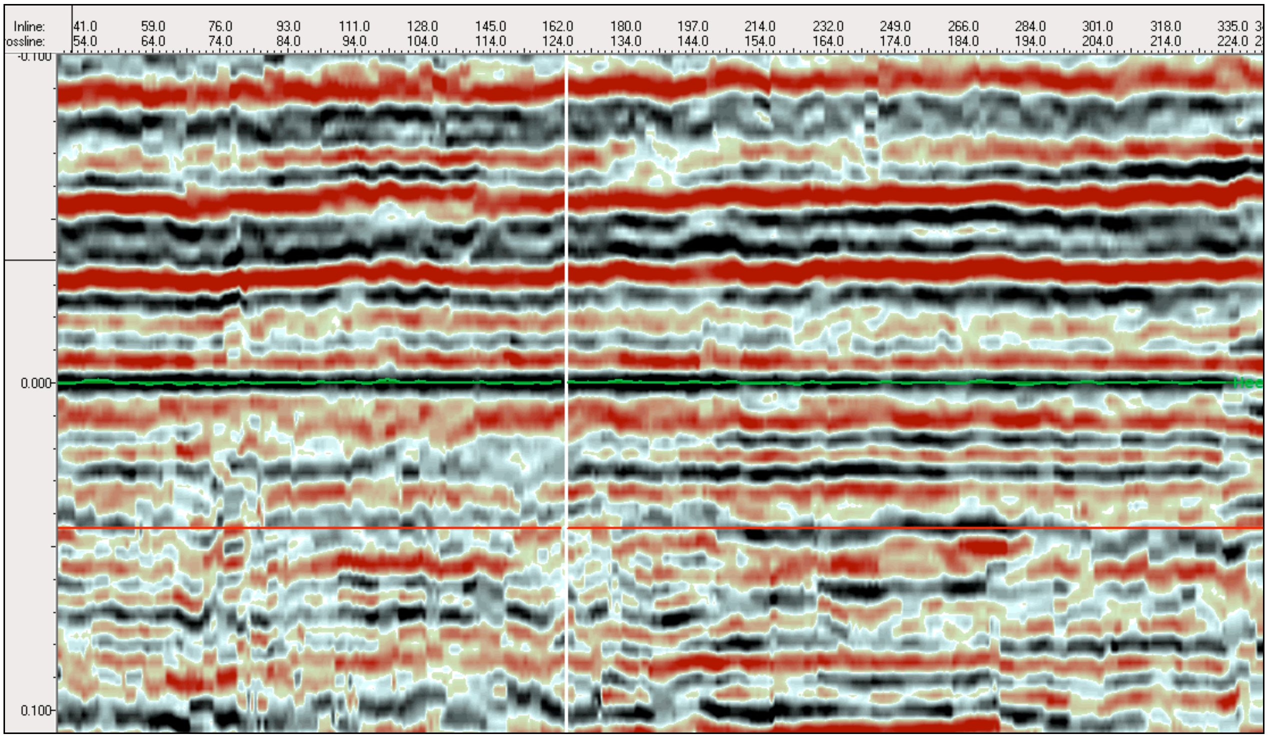

Figure 6. PSTM volume with basic PCA conditioning.

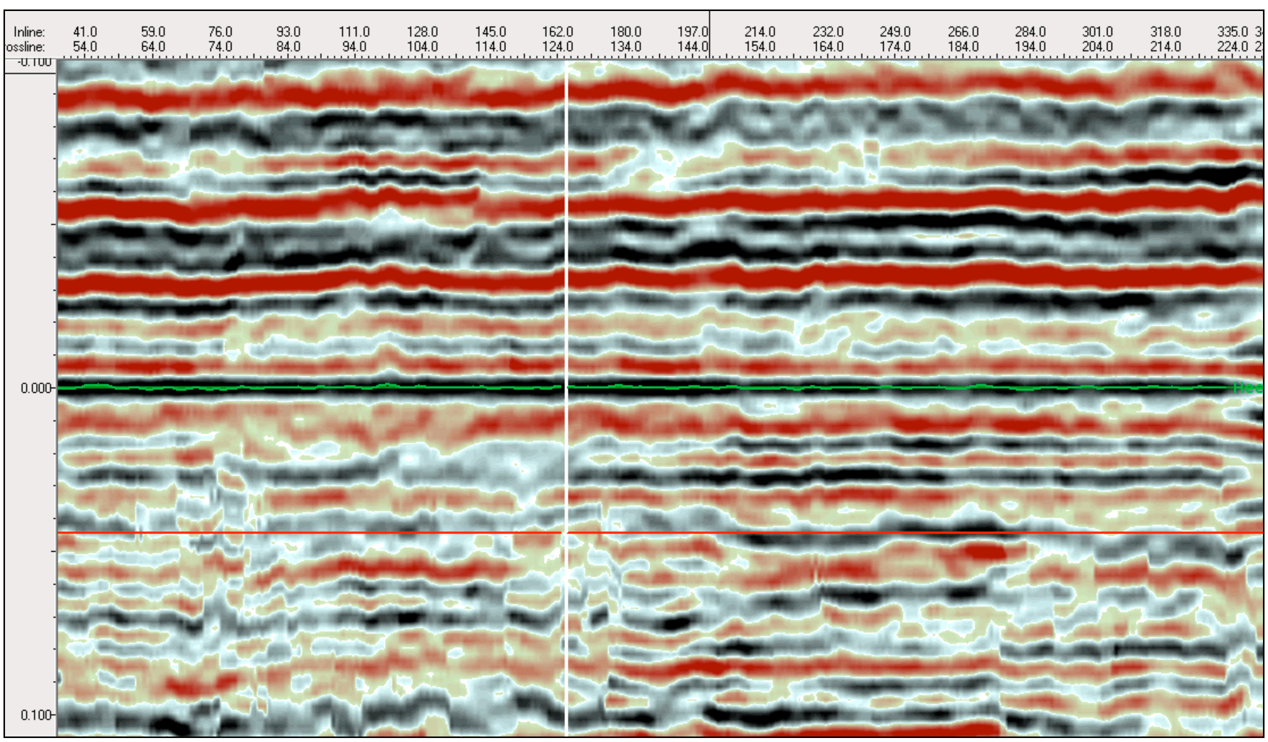

Figure 7. PSTM volume with enhanced PCA conditioning.

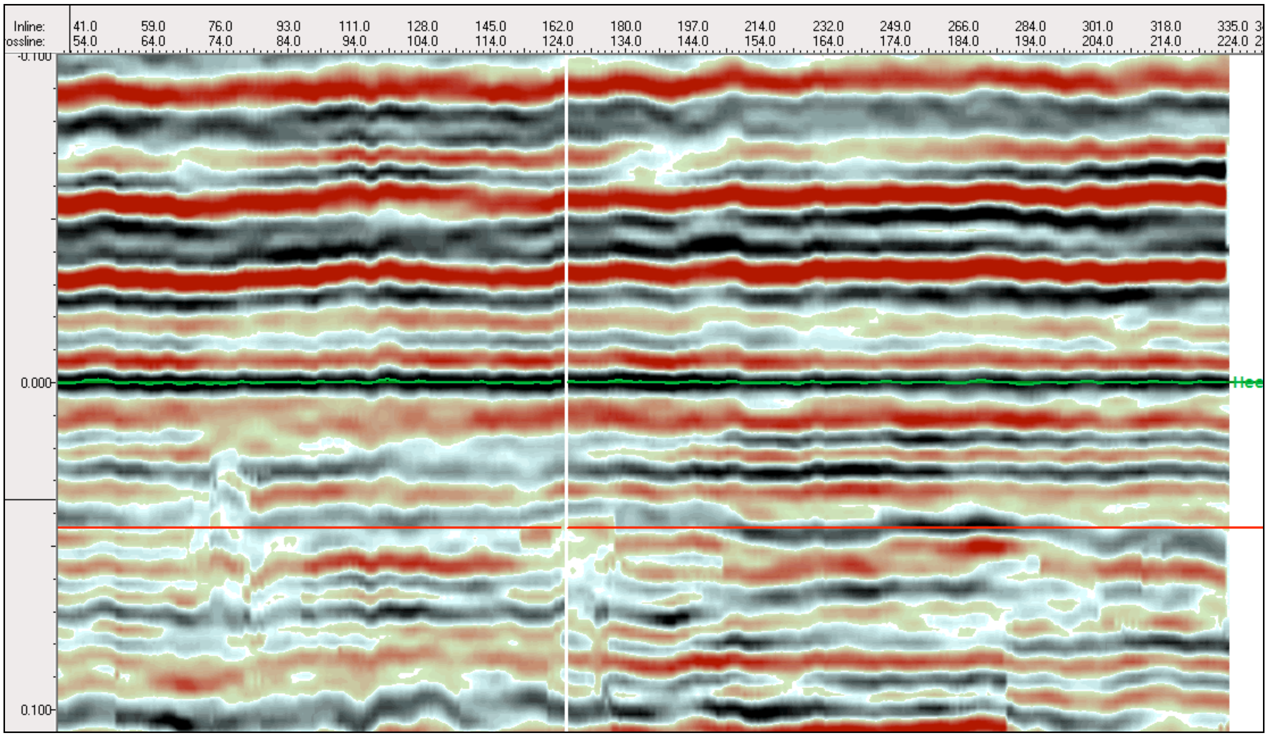

Figure 8. PSTM volume with heavy PCA conditioning.

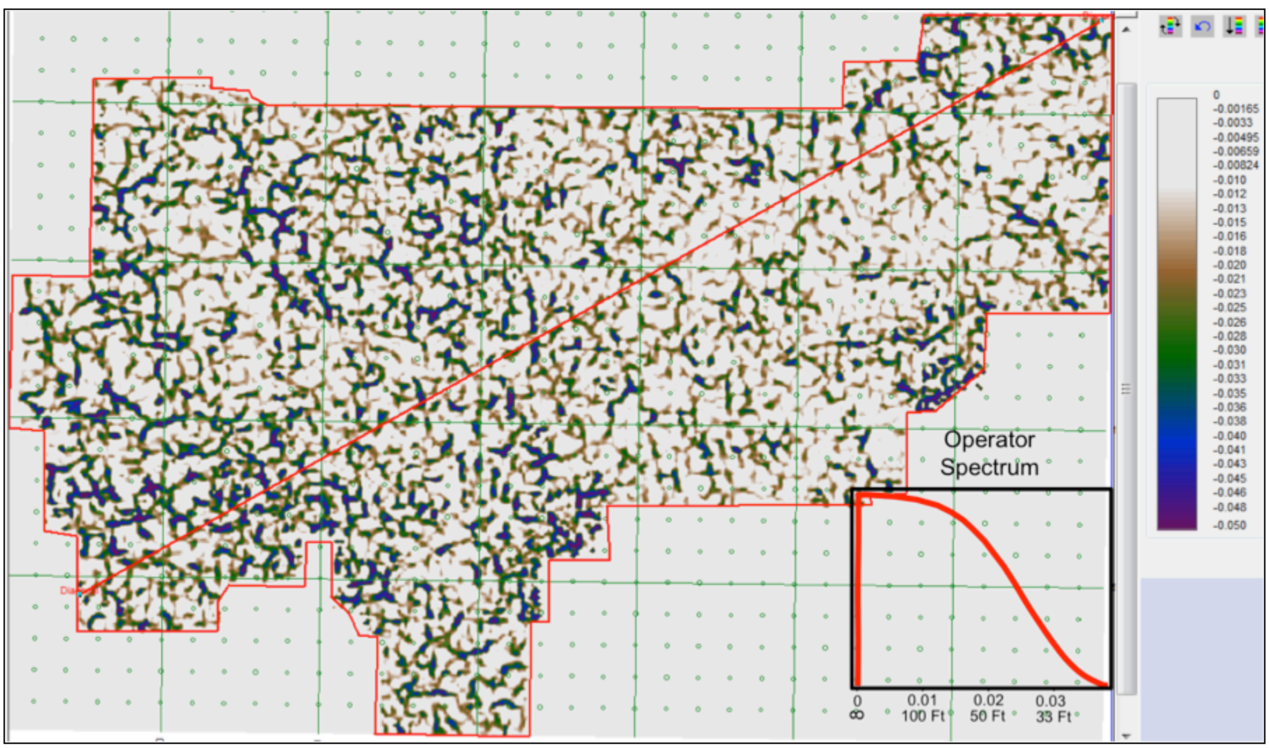

Figure 9. Map showing high-resolution, most negative curvature at Arbuckle without PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

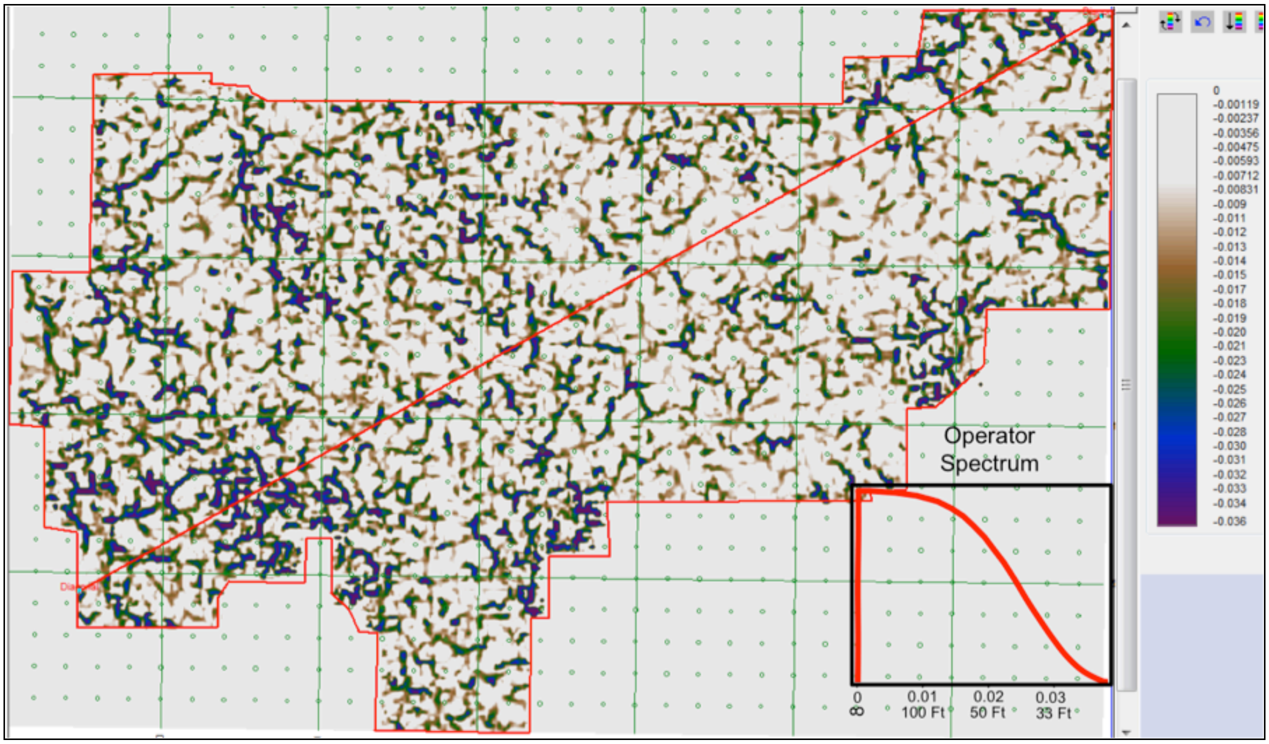

Figure 10. Map showing high-resolution, most negative curvature at Arbuckle using basic PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

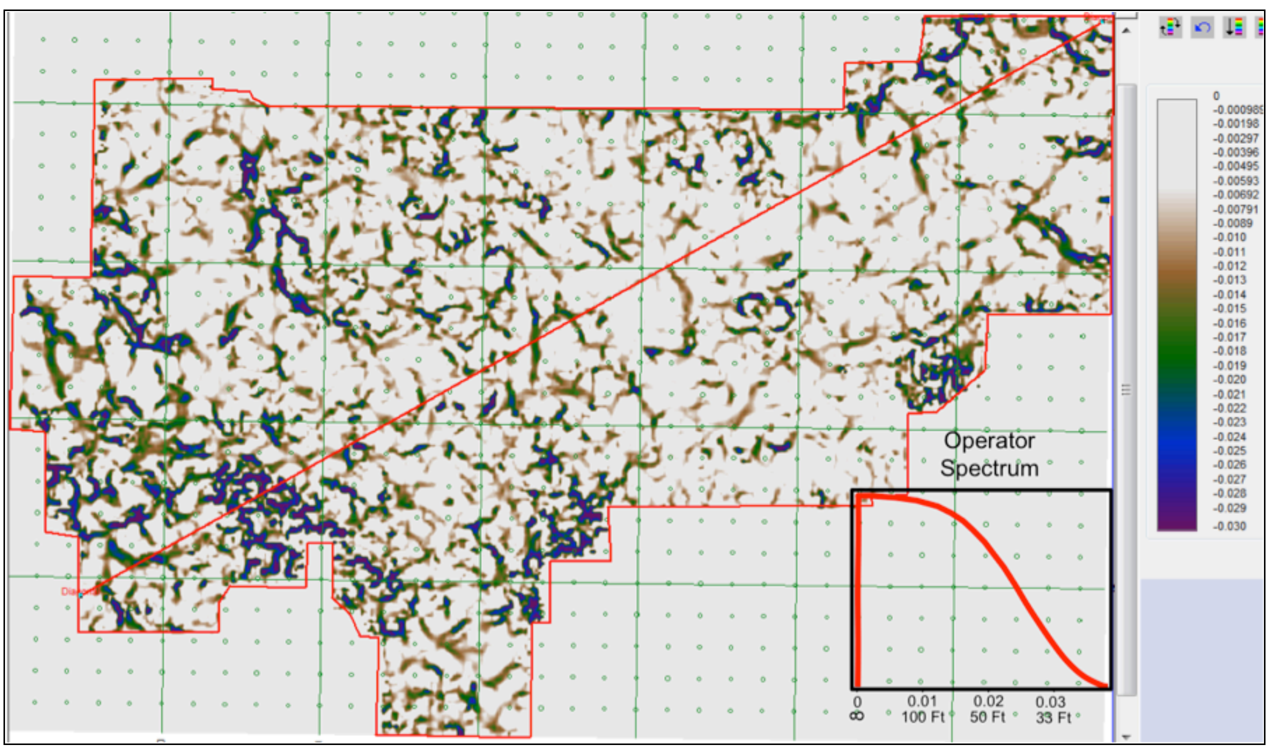

Figure 11. Map showing high-resolution, most negative curvature at Arbuckle using enhanced PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

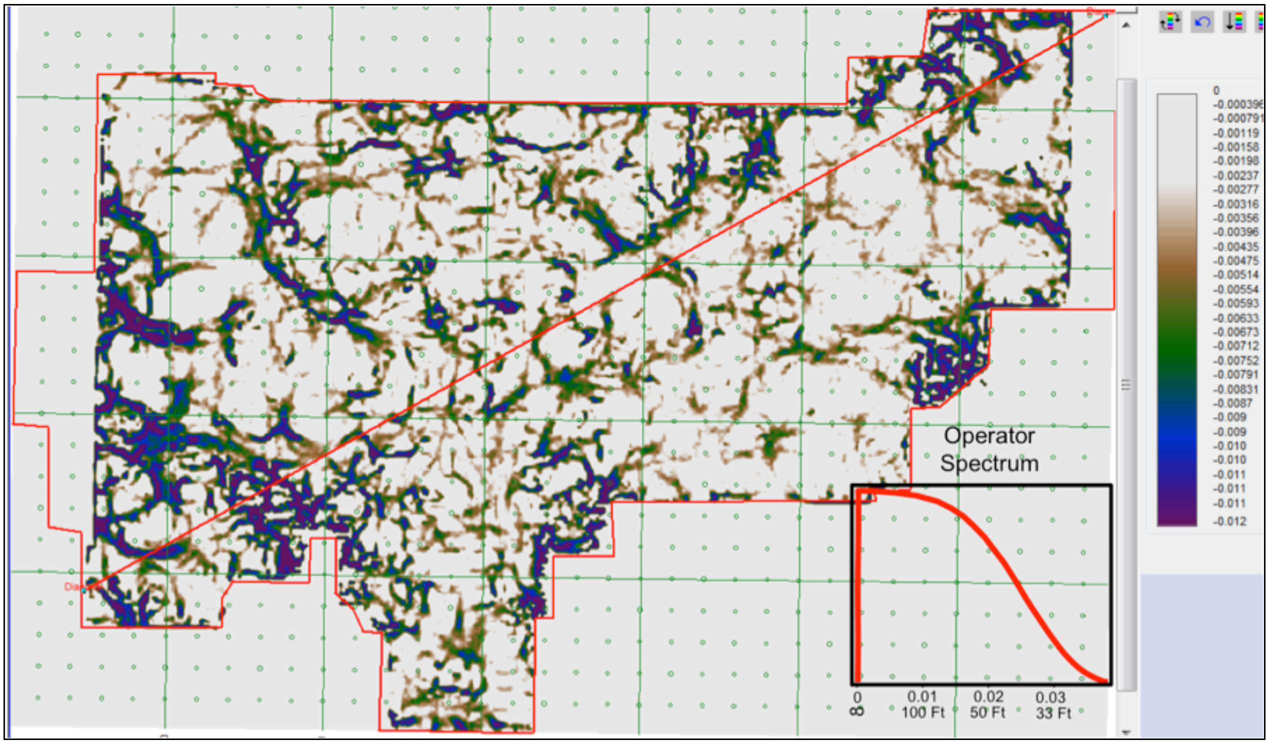

Figure 12. Map showing high-resolution, most negative curvature at Arbuckle using heavy PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

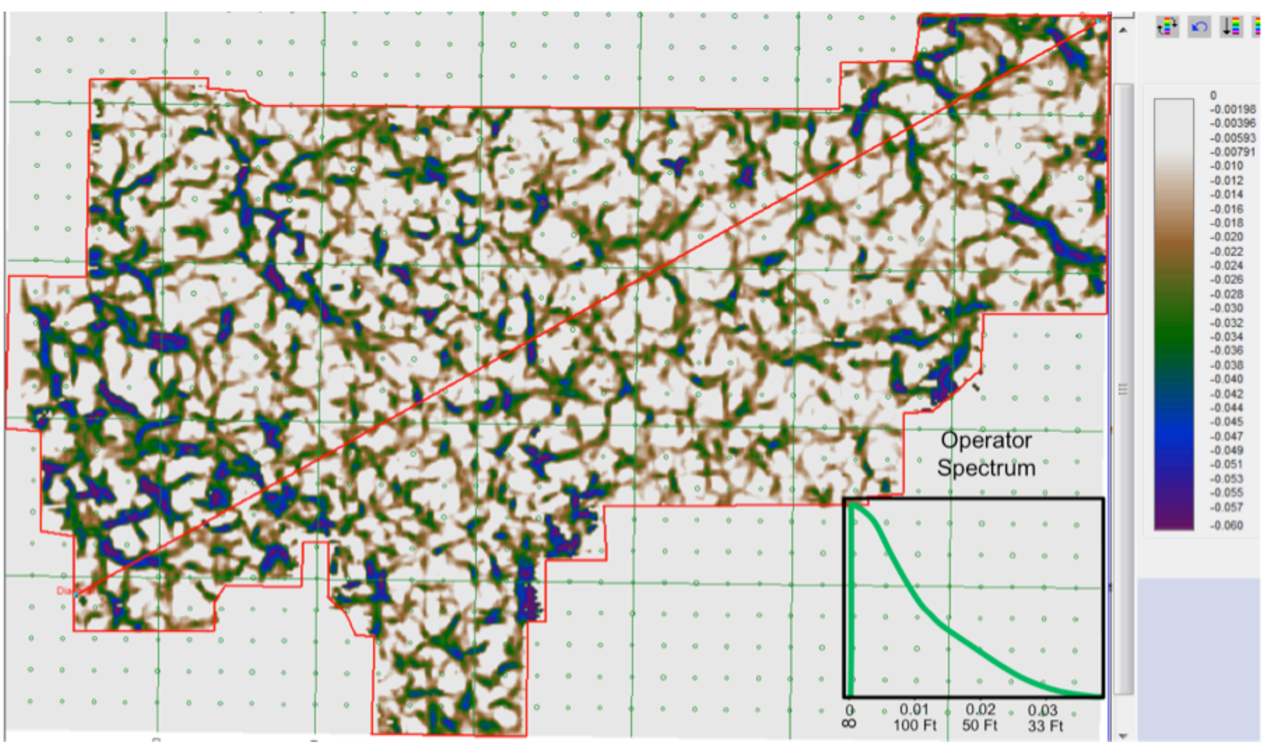

Figure 13. Map showing mid-resolution, most negative curvature at Arbuckle without PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

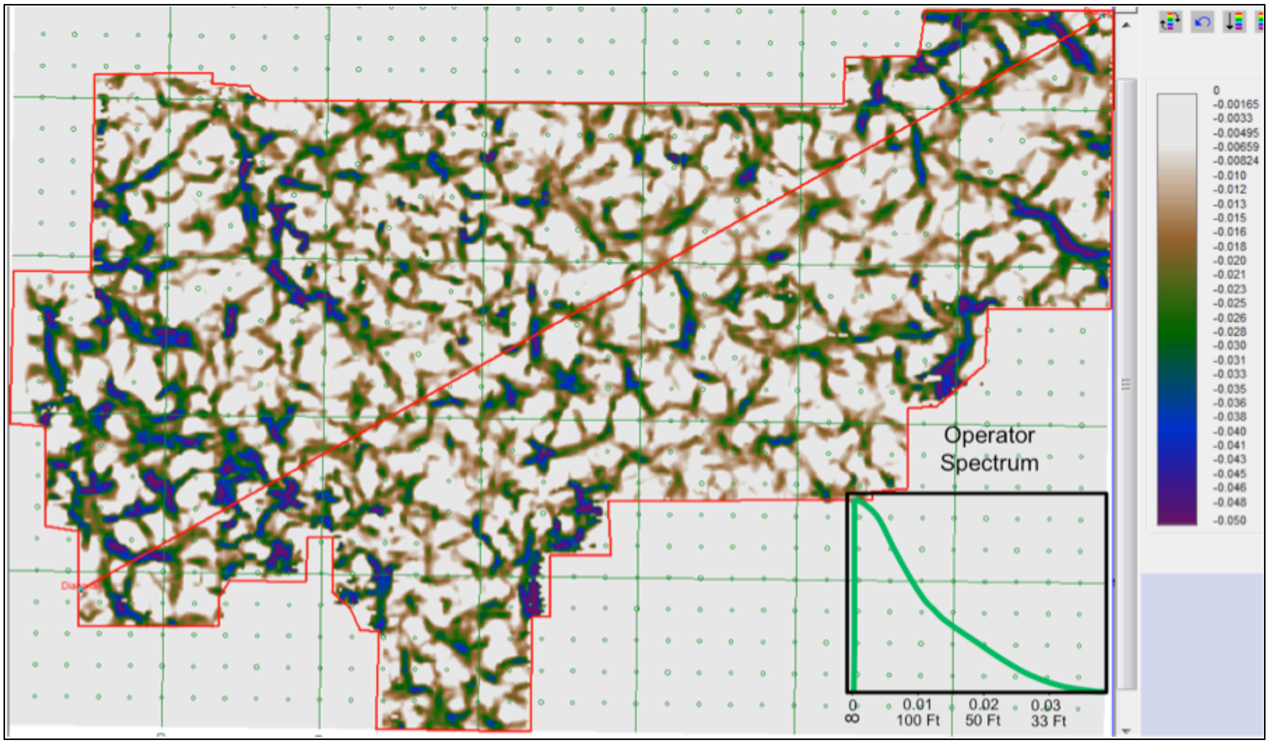

Figure 14. Map showing mid-resolution, most negative curvature at Arbuckle using basic PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

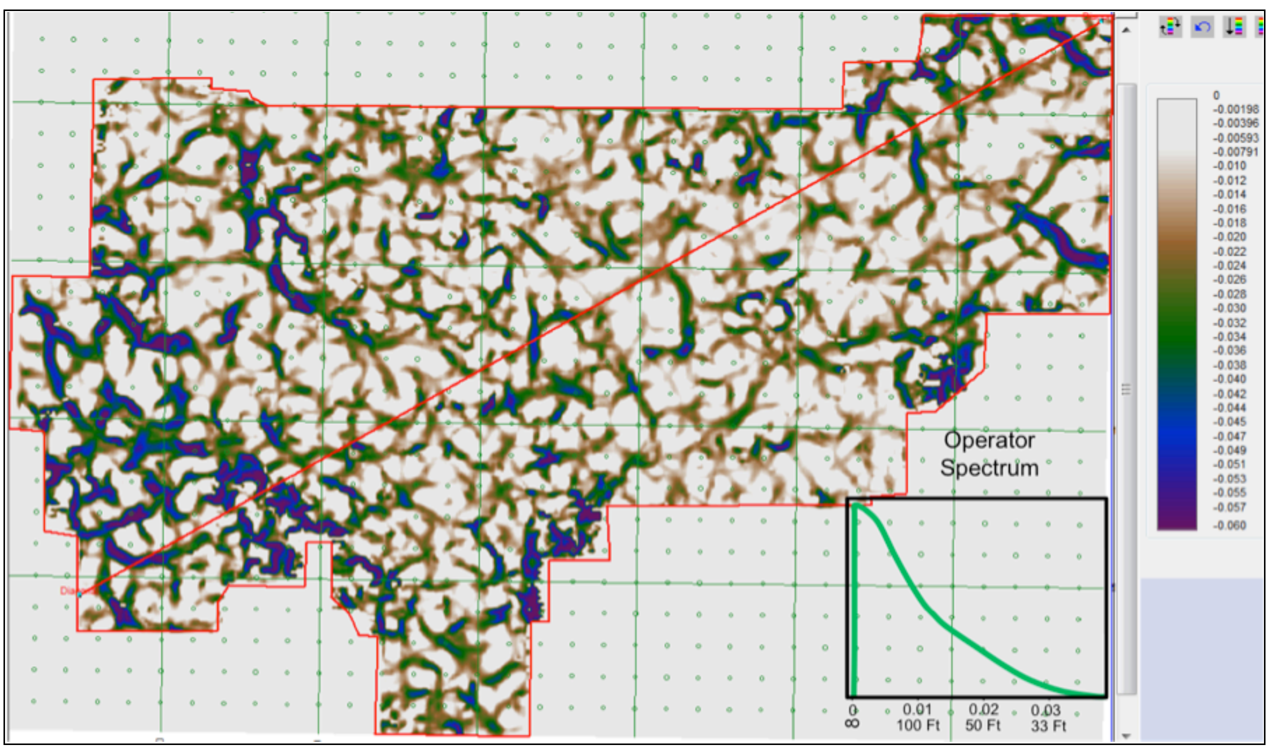

Figure 15. Map showing mid-resolution, most negative curvature at Arbuckle using enhanced PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

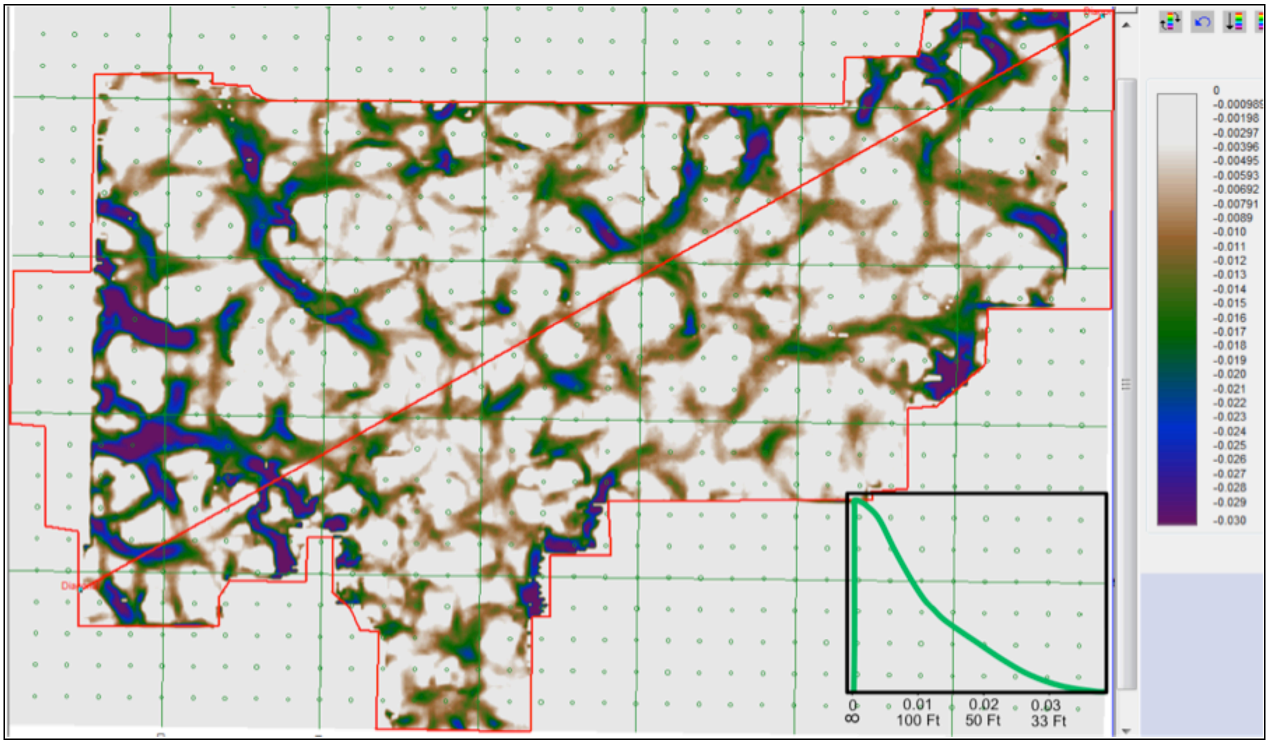

Figure 16. Map showing mid-resolution, most negative curvature at Arbuckle using heavy PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

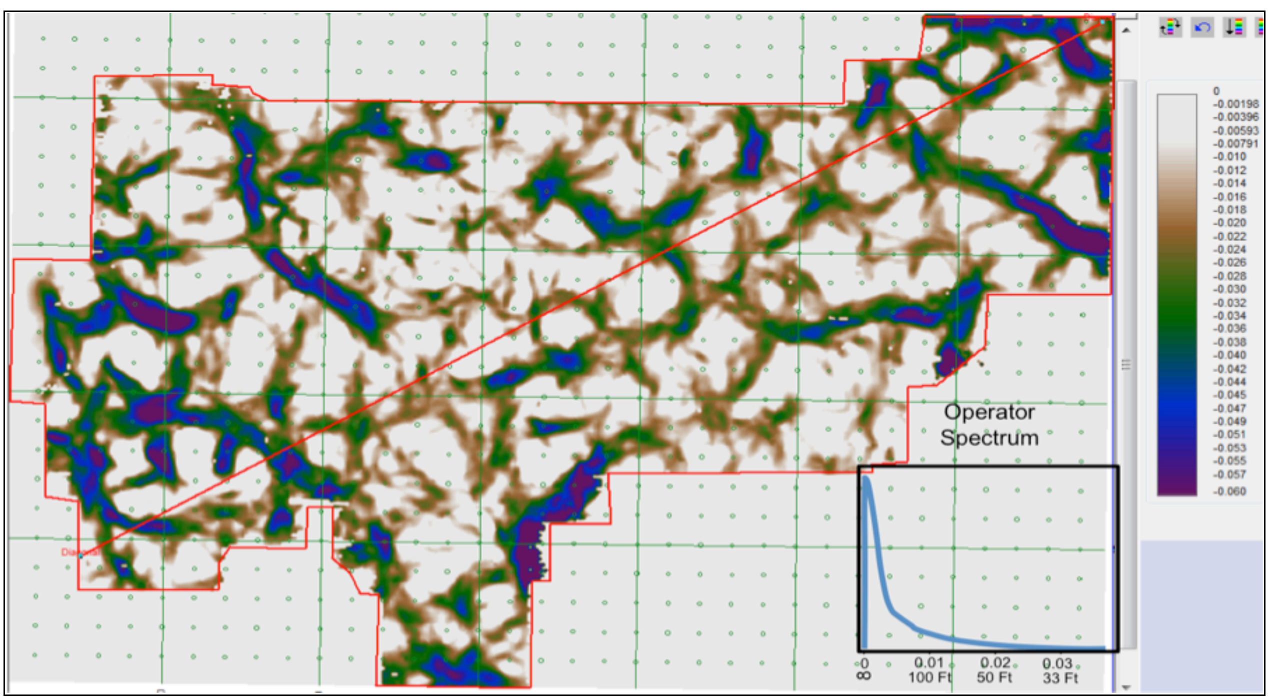

Figure 17. Map showing longwave-resolution, most negative curvature at Arbuckle without PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

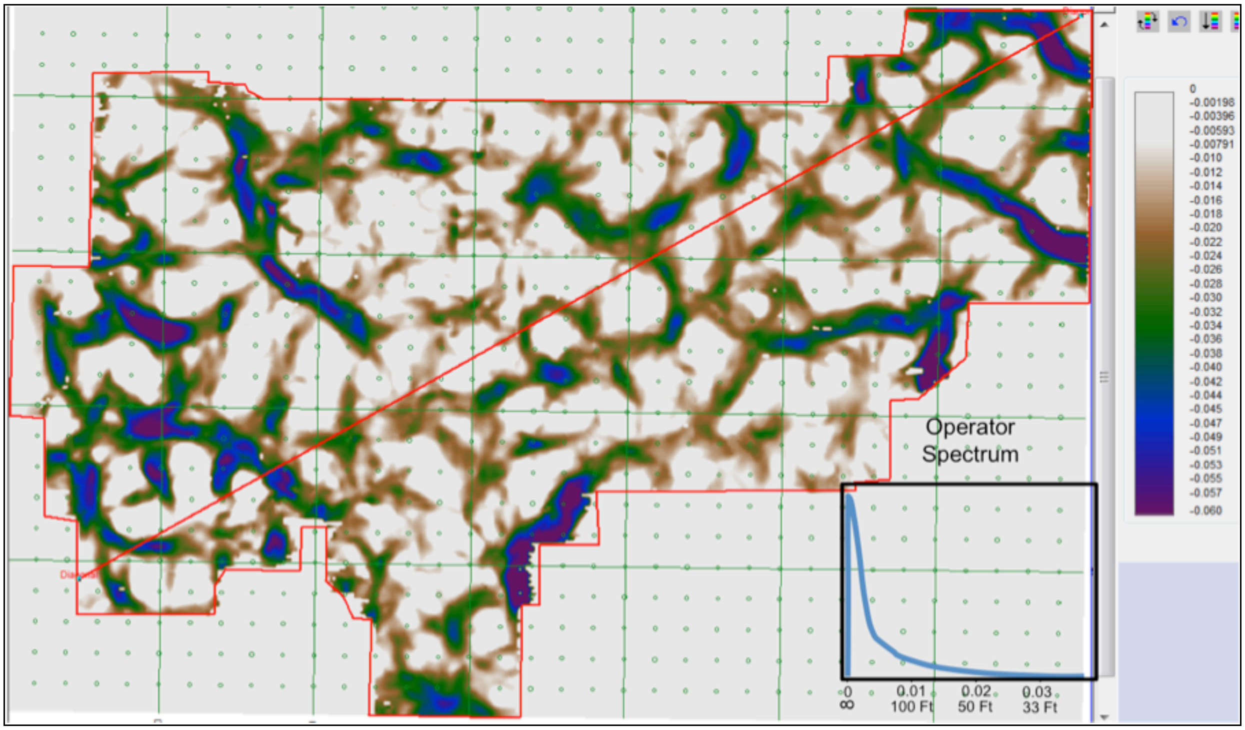

Figure 18. Map showing longwave-resolution, most negative curvature at Arbuckle using basic PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

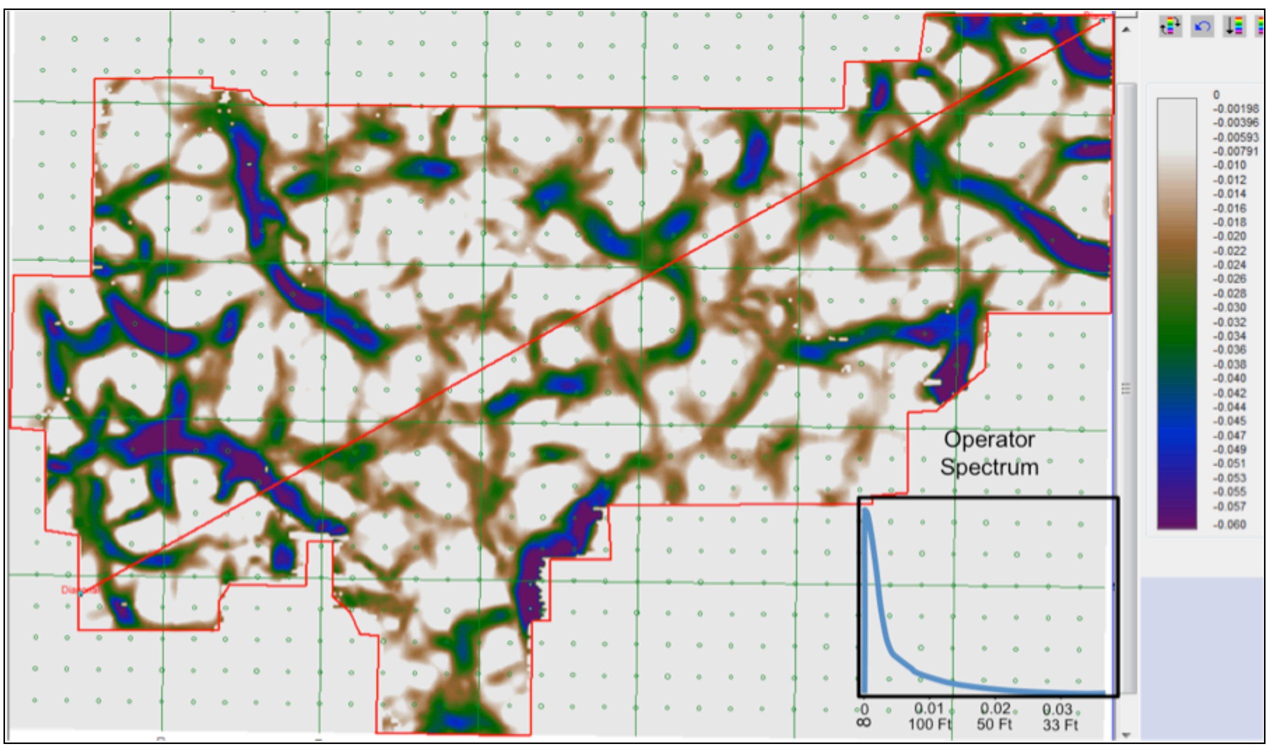

Figure 19. Map showing longwave-resolution, most negative curvature at Arbuckle using enhanced PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

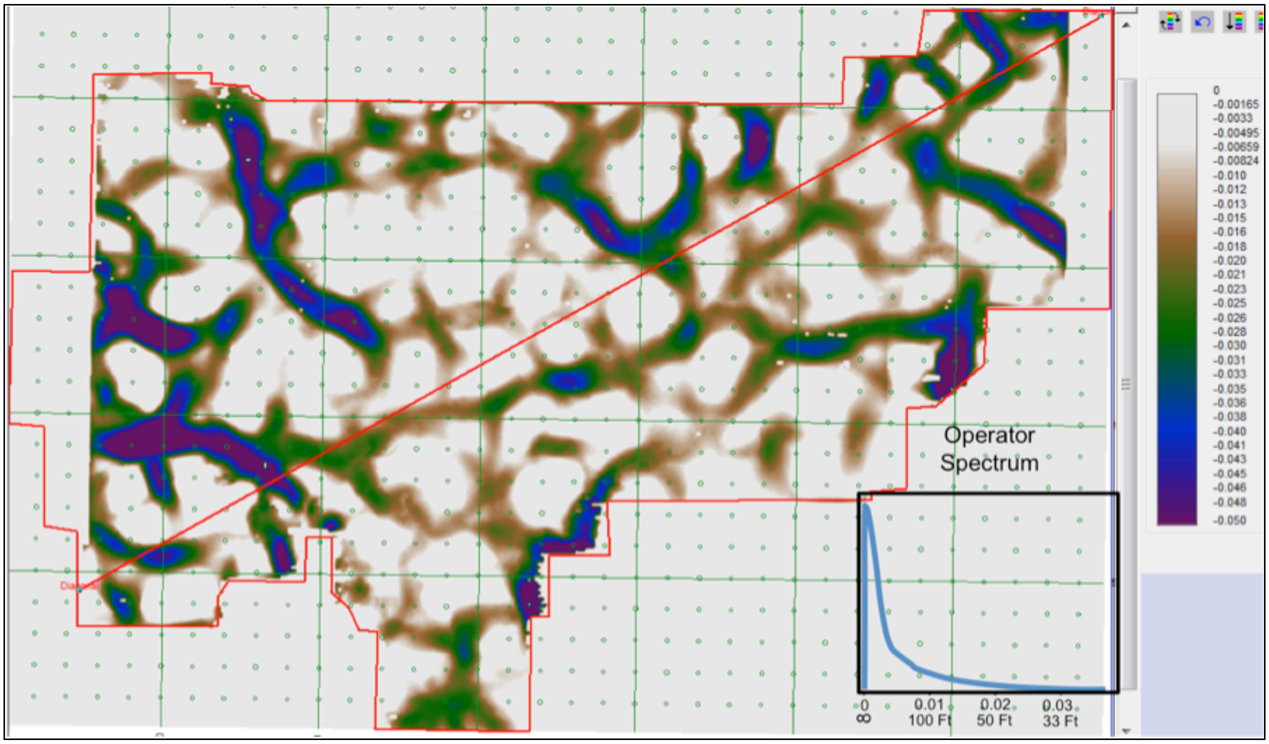

Figure 20. Map showing longwave-resolution, most negative curvature at Arbuckle using enhanced PCA conditioning. Graph on lower right graph showing what lateral wavelengths are passed for the operation.

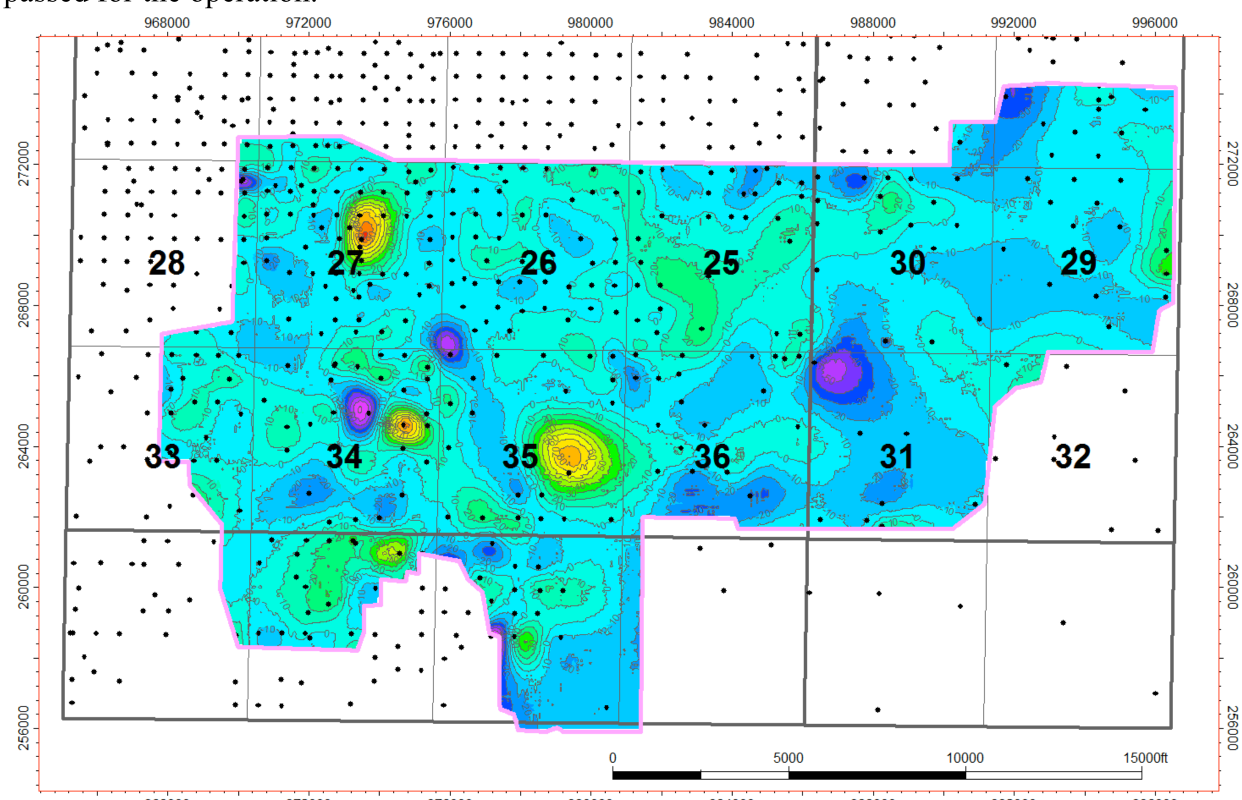

Figure 21. Difference map between well control and PSDM volume at top Arbuckle (CI: 10-ft).

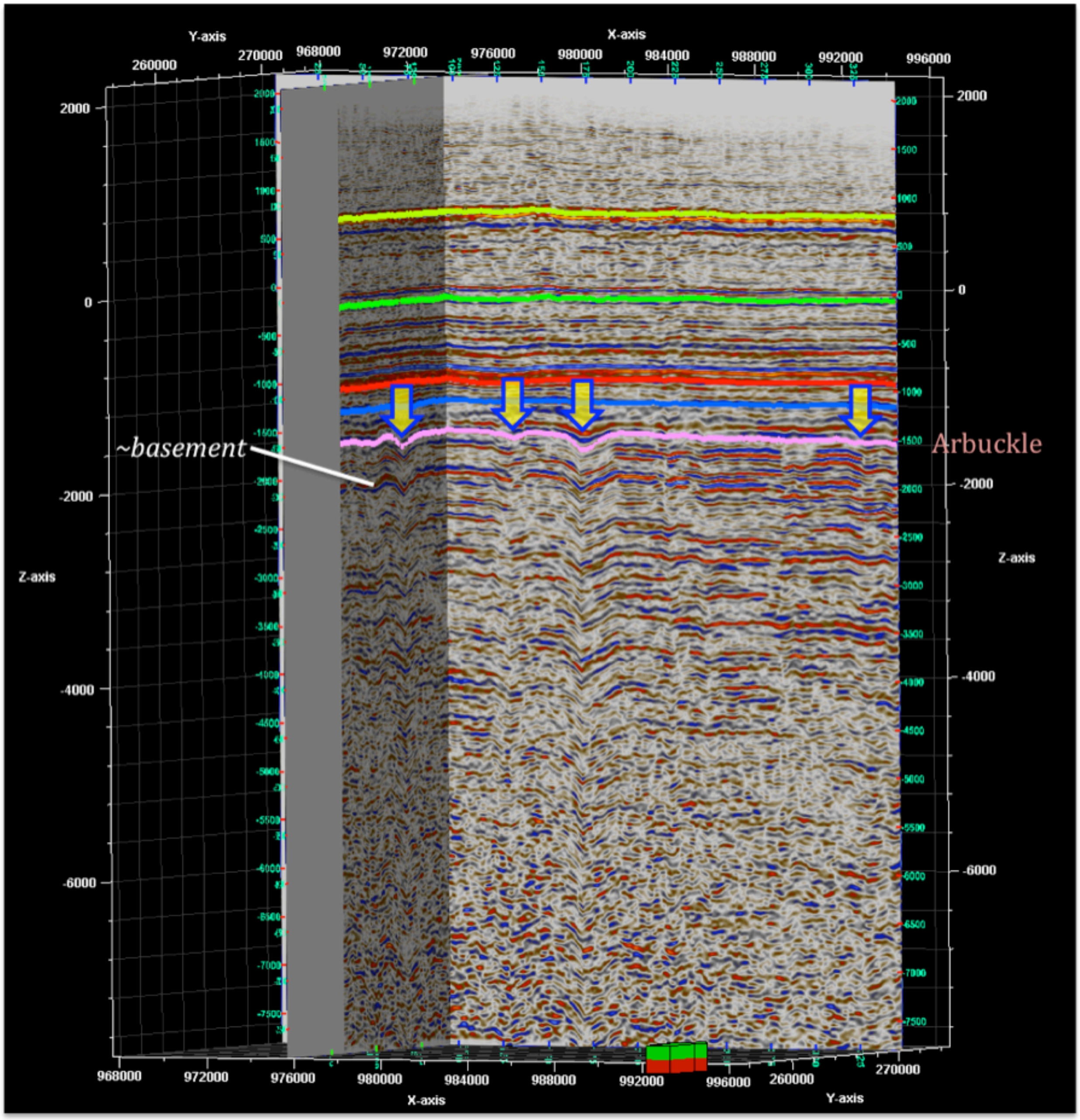

Figure 22. PSDM volume in Petrel showing sag features developed in the Arbuckle. Similar geometries recorded in the basement may reflect multiples. Overlying reflectors flatten up-section and likely record filling of paleokarst dolines.

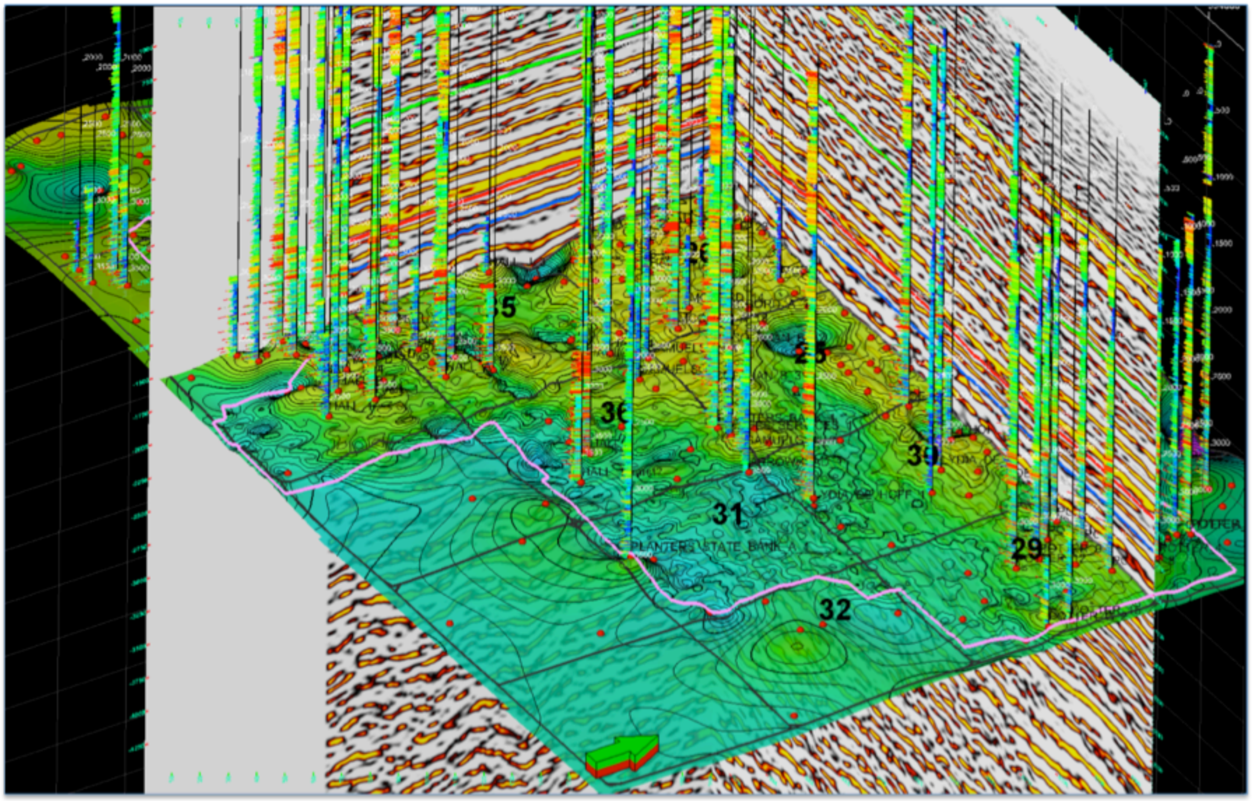

Figure 23. Top Arbuckle surface, PSDM cross lines, GR logs, and Arbuckle picks (red spheres) shown in a Petrel 3D window. The surface was generated using well control and the PSDM Arbuckle horizon as a trend. Large diameter (>2000-ft) sags are clearly visible.

Attachment 1 COST PLAN/STATUS

Baseline Reporting Quarter	Year 1 Starts: 10/1/10 10/1/10-12/31/10 Q1	Ends: 9/30/11 NCE to 12/31/11 1/1/11 - 3/31/11 Q2	4/1/11 - 6/30/11 Q3	7/1/11 - 9/30/11 Q4	10/1/11 - 12/31/11 Q5
Baseline Cost Plan (from SF-424A)	(from 424A, Sec. D)				
Federal Share	$329,999.00	$329,999.00	$329,999.00	$329,999.00	$0.00
Non-Federal Share	$82,826.75	$82,826.75	$82,826.75	$82,826.75	$0.00
Total Planned (Federal and Non-Federal)	$412,825.75	$412,825.75	$412,825.75	$412,825.75	$0.00
Cumulative Baseline Cost	$412,825.75	$825,651.50	$1,238,477.25	$1,651,303.00	$1,651,303.00
Actual Incurred Costs	thru 12/31/10	thru 3/31/11	thru 6/30/11		
Federal Share	$16,716.32	$83,793.01	$33,922.88		
Non-Federal Share	$3,044.15	$10,391.64	$10,513.22		
Total Incurred Costs-Quarterly (Federal and Non-Federal)	$19,760.47	$94,184.65	$44,436.10		
Cumulative Incurred Costs	$19,760.47	$113,945.12	$158,381.22		
Variance					
Federal Share	$313,282.68	$246,205.99	$296,076.12		
Non-Federal Share	$79,782.60	$72,435.11	$72,313.53		
Total Variance-Quarterly Federal and Non-Federal)	$393,065.28	$318,641.10	$368,389.65		
Cumulative Variance	**$393,065.28**	**$711,706.38**	**$1,080,096.03**		

Baseline Reporting Quarter	Year 2 Starts: 1/1/12 1/1/12 - 3/31/12 Q6	Ends: 12/31/12 4/1/12 - 6/30/12 Q7	7/1/12 - 9/30/12 Q8	10/1/12 - 12/31/12 Q9	1/1/13 - 3/31/13 Q10	Year 3 Starts: 1/1/13 4/1/13 - 6/30/13 Q11	Ends: 12/31/13 7/1/13 - 9/30/12 Q12	10/1/13 - 12/31/13 Q13
Baseline Cost Plan (from SF-424A)								
Federal Share	$45,948.50	$45,948.50	$45,948.50	$45,948.50	$23,686.75	$23,686.75	$23,686.75	$23,686.75
Non-Federal Share	$11,570.75	$11,570.75	$11,570.75	$11,570.75	$5,967.50	$5,967.50	$5,967.50	$5,967.50
Total Planned (Federal and Non-Federal)	$57,519.25	$57,519.25	$57,519.25	$57,519.25	$29,654.25	$29,654.25	$29,654.25	$29,654.25
Cumulative Baseline Cost	$1,708,822.25	$1,766,341.50	$1,823,860.75	$1,881,380.00	$1,911,034.25	$1,940,688.50	$1,970,342.75	$1,999,997.00
Actual Incurred Costs								
Federal Share								
Non-Federal Share								
Total Incurred Costs-Quarterly (Federal and Non-Federal)								
Cumulative Incurred Costs								
Variance								
Federal Share								
Non-Federal Share								
Total Variance-Quarterly Federal and Non-Federal)								
Cumulative Variance								

(7) Schedule/Milestone Status

Attachment 2

Task/ Subtask #	Project Milestone Description	Project Duration - Start: Oct. 1, 2010 End: Sept. 30, 2013												Planned Start Date	Planned End Date	Actual Start Date	Actual End Date	Comments (notes, explanation of deviation from plan)
		Project Year 1				Project Year 2				Project Year 3								
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12					
Subtask 2.1	Obtain 3D seismic, grav/mag, remote sensing, logs													10/1/10	1/1/11	10/1/10	1/31/01	Delay in data confidentiality negotiations and tracing missing logs
Subtask 3.9	Complete initial pre-spud geomodel													10/1/10	3/31/11	2/10/11		PSDM & VC volumes delivered. VC interpretation in progress. BP1 extension grantec
Subtask 4.3	History match and forecast.													3/1/11	6/13/11			Anticipate mid-August start date running parallel with well planning & permitting.