Time-Lapse Geochemistry

RESERVOIR GEOCHEMISTRY FOR DEVELOPMENT AND PRODUCTION OPTIMIZATION

Industry Challenges: Stacking and Spacing

PARENT-CHILD
Knowing when child wells are stealing production from parent wells

COMPLETION EFFICIENCY
Determining Drained Rock Volume (DRV) provides insights to completion optimization and potential completion savings

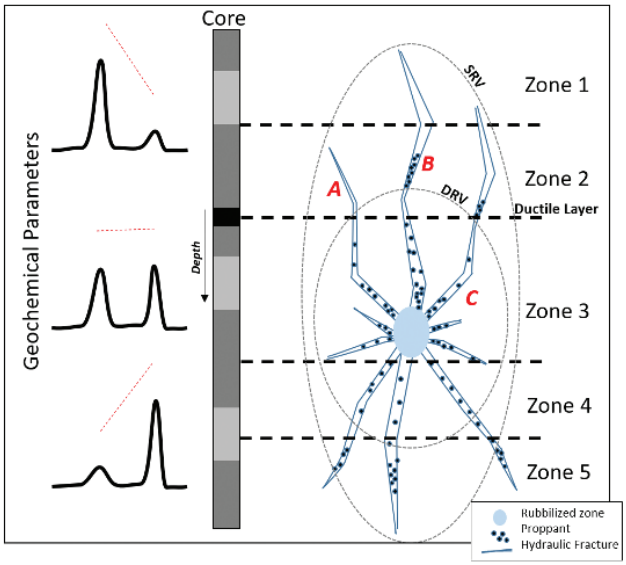
REMAINING RESOURCE
Creating a development plan to maximize recovery, without stealing production or leaving resources in the subsurface

THE CHALLENGE

- It can be difficult for resource plays to properly understand their Stimulated Rock Volume (SRV) and DRV.
- SRV methods overlook effects of unpropped "wet-frac" zones (A) and stranded well-propped fracs due to rapid fracture healing (B).

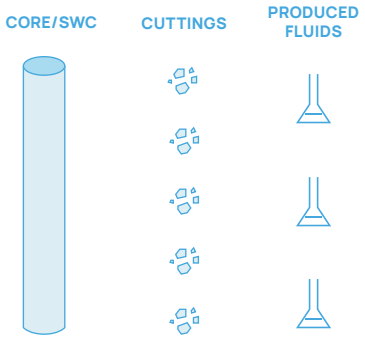
THE SOLUTION

- Geochemical measurements directly measure the well-propped drainage zone (C), and, when compared with baseline measurements such as core, can inform on drainage heights.
- Monitoring produced fluids through time gives a quantitative view on how the DRV evolves through time as pressure draw down effects take hold and surrounding child wells are brought online.
- Accurate understandings of DRV allow for optimization of stacking and spacing patterns.

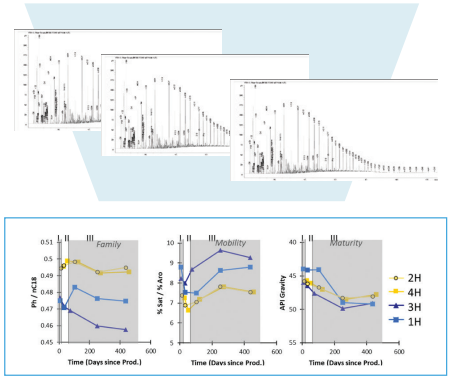


Geomark Research TLG Workflow

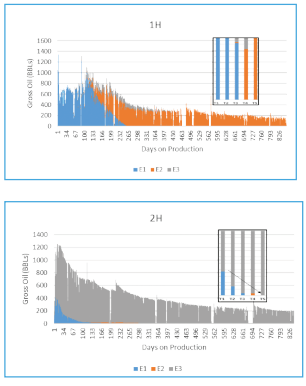
1. BASELINE GENERATION
Fluid family generation via core/SWC, cuttings or produced fluid analysis



2. PHASED FLUID CHARACTERIZATION
Produced fluid composition and properties (family, mobility and maturity)



3. QUANTITATIVE PRODUCTION ALLOCATION
Delivery of oil family/stratigraphic contribution to production



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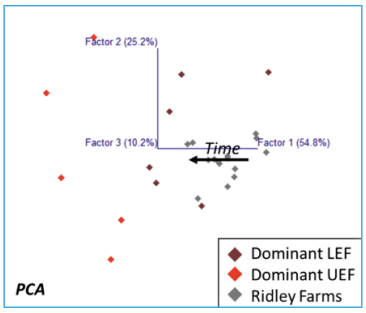
Time-Lapse Geochemistry

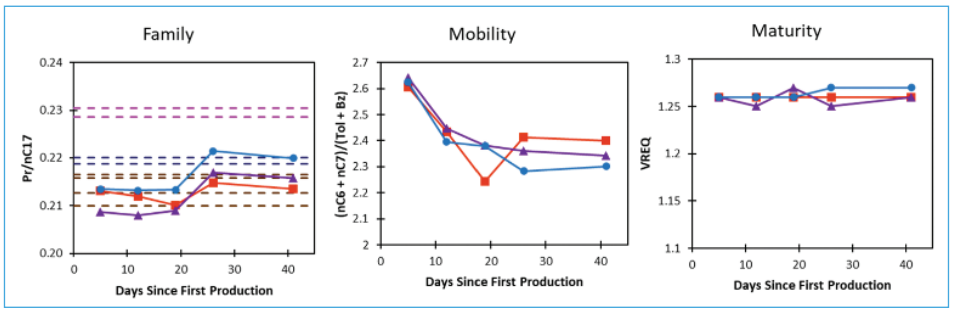
Case Study: Application of Time-Lapse Geochemistry to determine Upper Eagle Ford production contribution to Lower Eagle Ford lateral wells.

This case study presents the application of Time-Lapse Geochemistry on a pad of three wells to determine if the Lower Eagle Ford lateral wells were producing from the Upper Eagle Ford.

The Analysis

- Five time samples were collected from each of the three Lower Eagle Ford lateral wells.
- These were analyzed using GeoMark's suite of geochemical analyses to generate meaningful and repeatable data for statistical analysis.
- Through time, it is possible to note slight variations in oil family and mobility. Maturity remained relatively constant.





The Results

Principal Component Analysis (PCA) performed on the produced and baseline fluids (Lower Eagle Ford and Upper Eagle Ford) highlight the produced fluids (Ridley Farms) being characteristic of the Lower Eagle Ford.

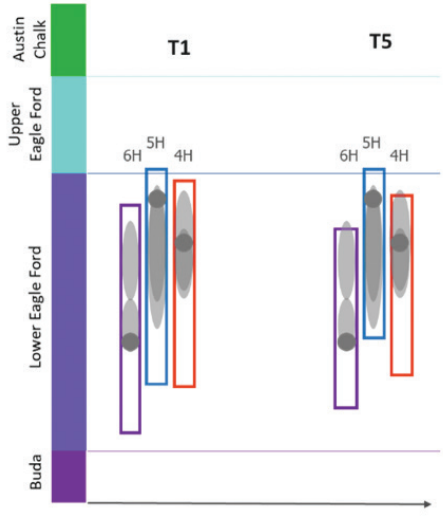
WANT TO HEAR MORE ABOUT THIS PROJECT?

Check out the Episode 115 of the PBE Podcast on Spotify!

PBE PODCAST Spotify

The Conclusion

Analysis of our results concluded that additional development is required to access and produce the Upper Eagle Ford resource.



UNCONVENTIONAL RESOURCES TECHNOLOGY CONFERENCE

URTeC: 3720662

TIMELAPSE GEOCHEMISTRY PRODUCTION ALLOCATION; END MEMBER DEFINITION AND SELECTION; CASE STUDIES, DELAWAR BASIN AND EAGLE FORD

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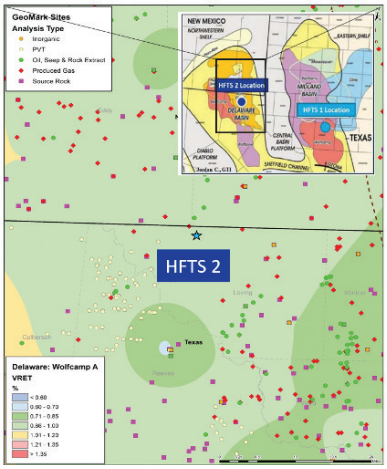
Time-Lapse Geochemistry

CASE STUDY: Permian Basin

This case study was completed on the Hydraulic Fracturing Test Site-2 (HFTS-2), which is a well-studied industry and government consortium project area to better understand the hydraulic fracturing interactions efficiencies within the subsurface. Several techniques were deployed at the test site to better understand flow units from the initial Stimulated Rock Volume (SRV) to the actual Drained Rock Volume (DRV) over time in the Wolfcamp Formation.

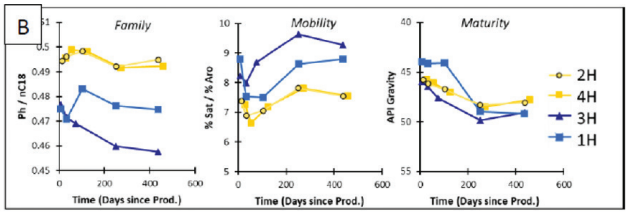


THE DATABASE

- Four wells analyzed (1H, 2H, 3H and 4H)
- Five time stamp samples collected and analyzed over 400 days of production

The Results

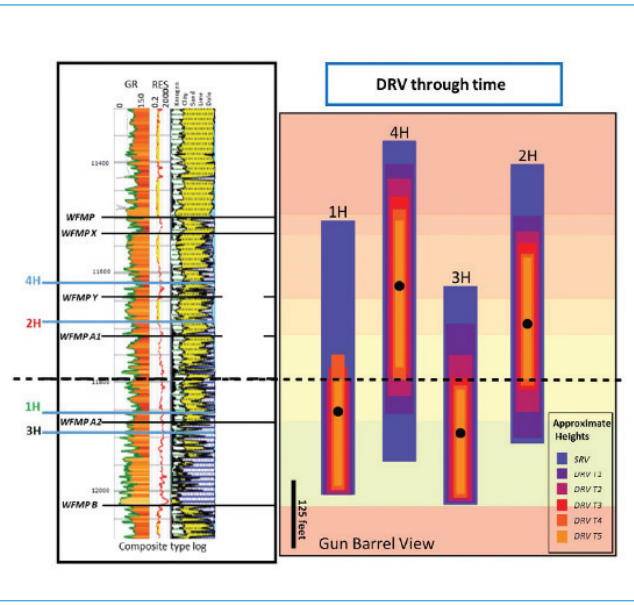
Principal Component Analysis (PCA) performed on the geochemical data identified a variation in fluid properties over time. Wells 2H and 4H maintained a similar family throughout production with wells 1H and 3H hosting a similar oil family at the start and then deviating from one another over production time. This observation reflects the variation in oil character between Wolfcamp Y and Wolfcamp A.



The Conclusion

The implication of these results clearly indicated some sort of permeability 'baffle' between Wolcamp A and Wolfcamp Y. From other subsurface monitoring analysis (micro seismic), and early oil production, it was noted that fracturing events did propagate up into Wolfcamp Y which is further confirmed by the presence of Wolfcamp Y oils in the Wolfcamp A landed wells (1H & 3H).

Ultimately, this information can assist in the optimization of both development and completion approaches to maximize wellbore contact and drainage within the subsurface, while reducing expenses on ineffective completions.



Want to learn more about this project?
Adam Turner et al., Integration of Time Lapse Geochemistry to Enhance Subsurface Characterization at Hydraulic Fracture Test Site II, SPWLA 63rd Annual Logging Symposium, June 10-15, 2022

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