Petroleum Systems in the Permian Basin:

Targeting optimum oil production©

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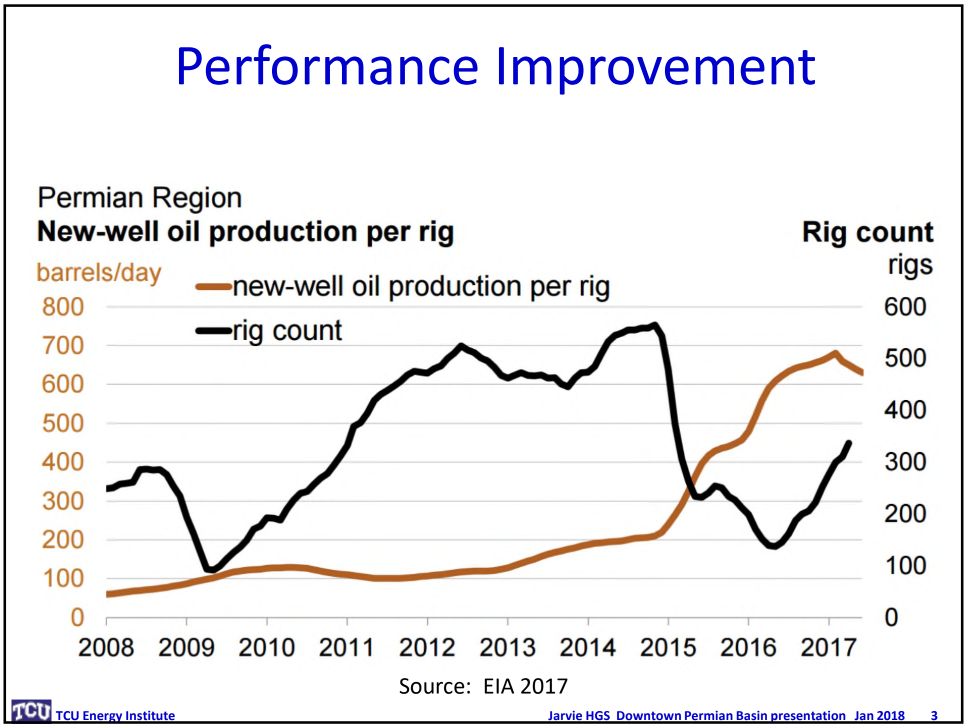
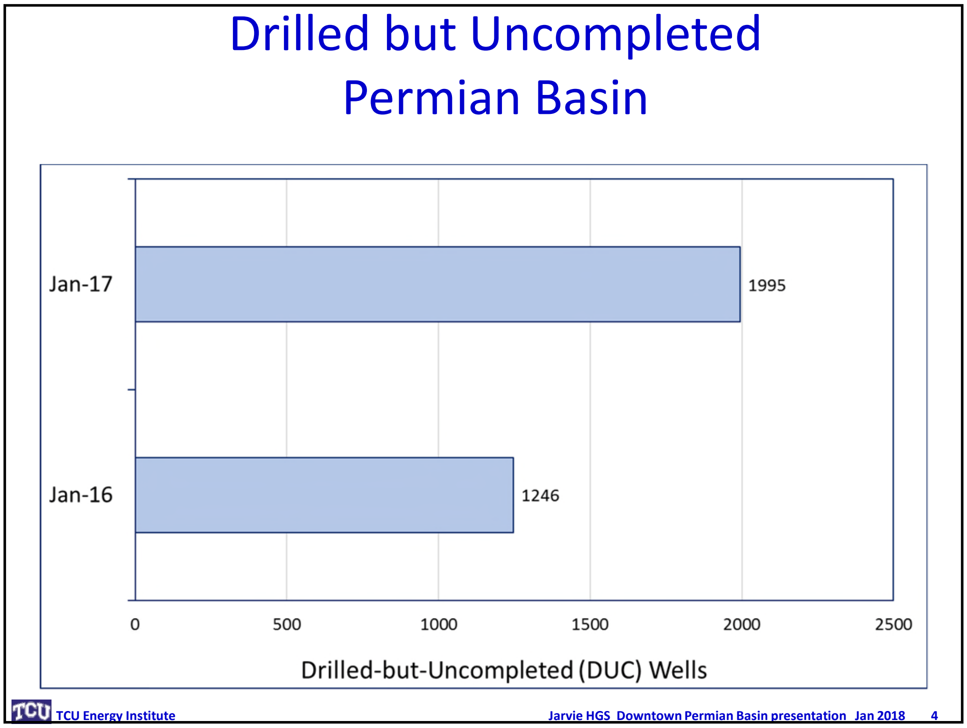
Outline

- Introduction
- Background
- Petroleum Systems
  - Classification
  - Organofacies
- Sample quality
- Identifying best oil zones
- Oil SARA assessment
- Thermal maturity assessments
- Restoring oil and predicting quality/phase
- Alpine High
- Synopsis



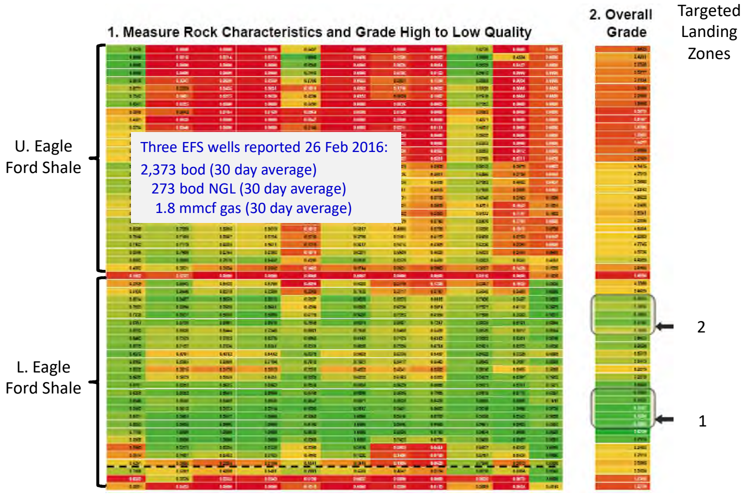
Performance Improvement

Source: EIA 2017



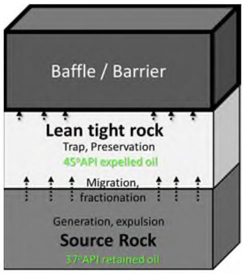
Drilled but Uncompleted Permian Basin

“EOG Resources: Identifying Best Horizontal Targets”

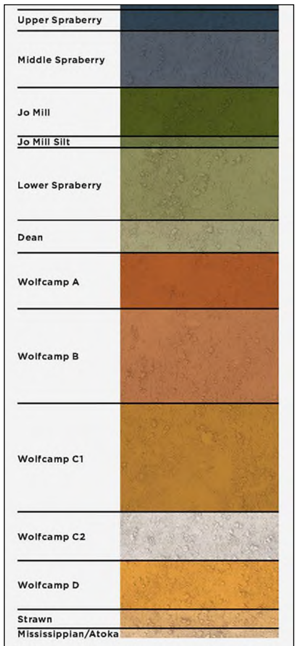


Three EFS wells reported 26 Feb 2016:
2,373 bod (30 day average)
273 bod NGL (30 day average)
1.8 mmcf gas (30 day average)

EOG Fourth Quarter 2015 Investor Relations Report dated 16 February 2016

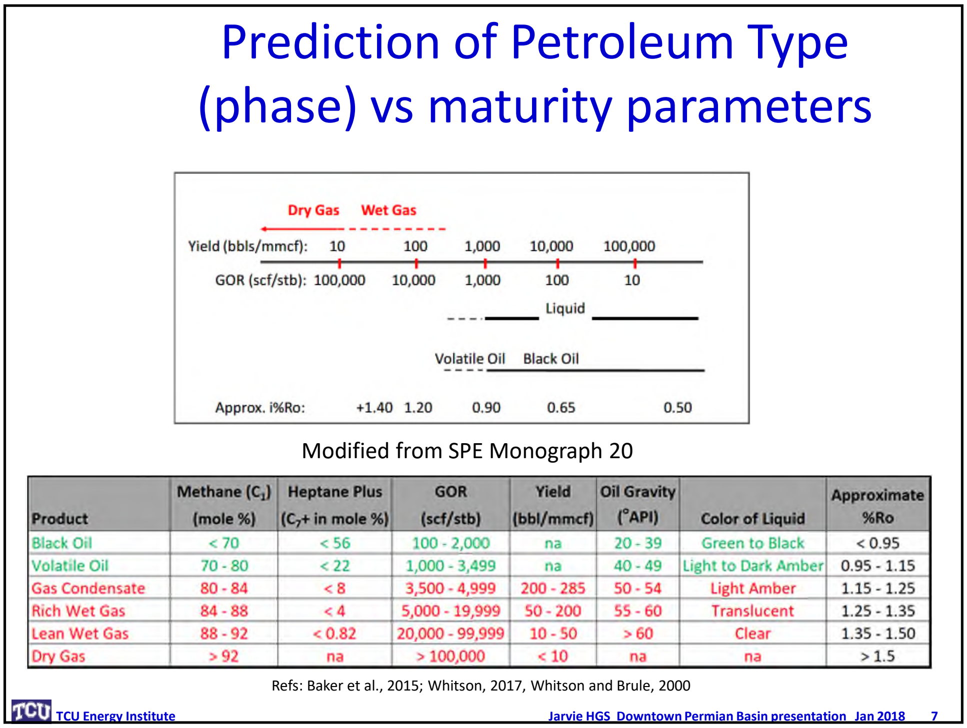


Where might such complexities occur in petroleum system(s)?



© Pioneer Natural Resources Company 2013 Annual Report

Understanding controls on target(s) becomes a key component in achieving the best production results

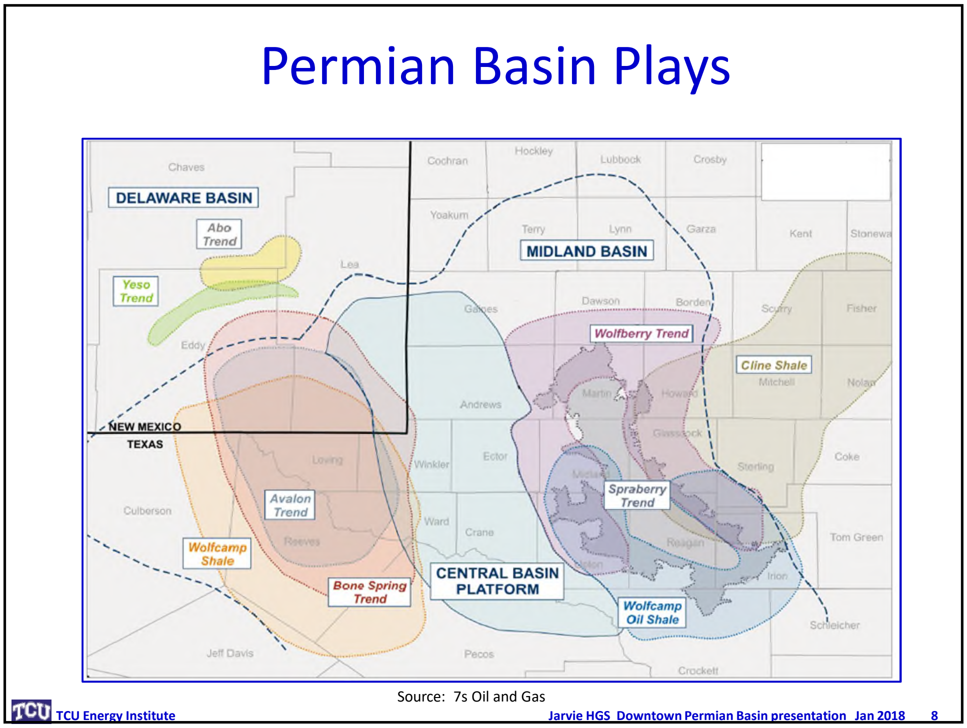


Prediction of Petroleum Type (phase) vs maturity parameters

Modified from SPE Monograph 20

Product	Methane (C_1) (mole %)	Heptane Plus (C_7+ in mole %)	GOR (scf/stb)	Yield (bbl/mmcf)	Oil Gravity (°API)	Color of Liquid	Approximate %Ro
Black Oil	< 70	< 56	100 - 2,000	na	20 - 39	Green to Black	< 0.95
Volatile Oil	70 - 80	< 22	1,000 - 3,499	na	40 - 49	Light to Dark Amber	0.95 - 1.15
Gas Condensate	80 - 84	< 8	3,500 - 4,999	200 - 285	50 - 54	Light Amber	1.15 - 1.25
Rich Wet Gas	84 - 88	< 4	5,000 - 19,999	50 - 200	55 - 60	Translucent	1.25 - 1.35
Lean Wet Gas	88 - 92	< 0.82	20,000 - 99,999	10 - 50	> 60	Clear	1.35 - 1.50
Dry Gas	> 92	na	> 100,000	< 10	na	na	> 1.5

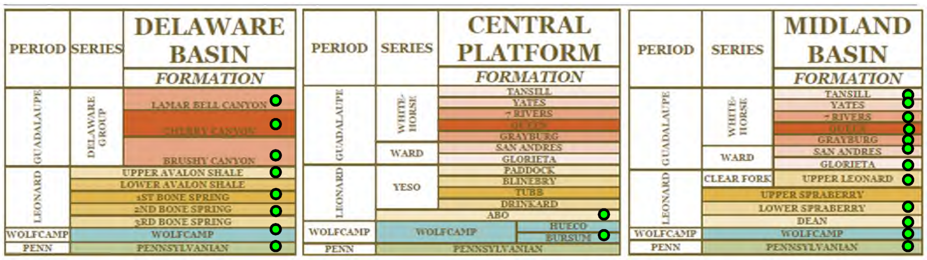
Refs: Baker et al., 2015; Whitson, 2017, Whitson and Brule, 2000



Permian Basin Plays

Source: 7s Oil and Gas

Stratigraphy
with oil and rock samples analyzed



Mississippian	Barnett	●
Devonion	Woodford	●
Ordovician	Ellenburger	●

Permian Basin Petroleum Systems

- Permian Guadalupian (3)
- Permian Leonardian Bone Springs (2)
- Permian Spraberry
- Permian Wolfcampian (2)
- Pennsylvanian (3)
- Mississippian Barnett Shale
- Devonian-Mississippian Woodford Shale (2)
- Ordovician Simpson Formation (2)

Refs: Jones and Smith, 1965; Williams, 1977; Jarvie et al., 2001; Hill et al., 2003; Curtis and Zumberge, 2017

Why is it more difficult to produce black oil from tight shale?

- Permeability
- Molecular size: physical limitation
- Viscosity: resistance to flow
- Polarity:
  - adsorptive affinity
  - Wettability
- GOR: pressure
- et al. …

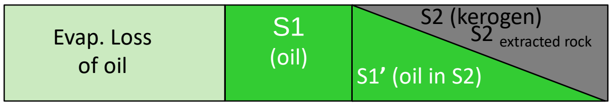
Select Risk Factors for plays and targets

Unconventional Development Risk Factors					
⇨ **RF-1**	Oil Crossover	➡ **RF-16**	Water saturation	➡ **RF-31**	Barrier
RF-2	$\text{TOC}_{\text{original}}$	**RF-17**	Gas saturation	**RF-32**	Healed Fractures
RF-3	$\text{HI}_{\text{original}}$	**RF-18**	Overpressured	**RF-33**	Open Fractures
RF-4	$\text{TOC}_{\text{present-day}}$	**RF-19**	Thickness	**RF-34**	Faults
RF-5	$\text{HI}_{\text{present-day}}$	**RF-20**	Burial history	**RF-35**	Structure
RF-6	Depositional System	**RF-21**	$\text{Depth}_{\text{present-day}}$	**RF-36**	Terrain
RF-7	Source or Hybrid	**RF-22**	$\text{Depth}_{\text{max}}$	**RF-37**	Infrastructure
⇨ **RF-8**	Maturity	**RF-23**	Carbonate	**RF-38**	Oil/Gas prices
RF-9	TR	**RF-24**	Quartz	**RF-39**	Proppant
⇨ **RF-10**	SARA	**RF-25**	Clay	**RF-40**	Services
RF-11	API gravity	➡ **RF-26**	Organofacies	**RF-41**	Rigs
⇨ **RF-12**	GOR	➡ **RF-27**	Brittleness		
RF-13	Porosity	**RF-28**	Poisson ratio		
RF-14	Permeability	**RF-29**	Youngs Modulus		
RF-15	Oil saturation	➡ **RF-30**	Baffle		

⇨ in presentation

➡ discussed in talk

Oil Content in Rock Sample as measured by thermal extraction



Evap. Loss
of oil

S1
(oil)

S2 (kerogen)

S2 extracted rock

S1' (oil in S2)

Overlap of free oil and oil carried over into S2
This is a function of oil type and isolated organic pores

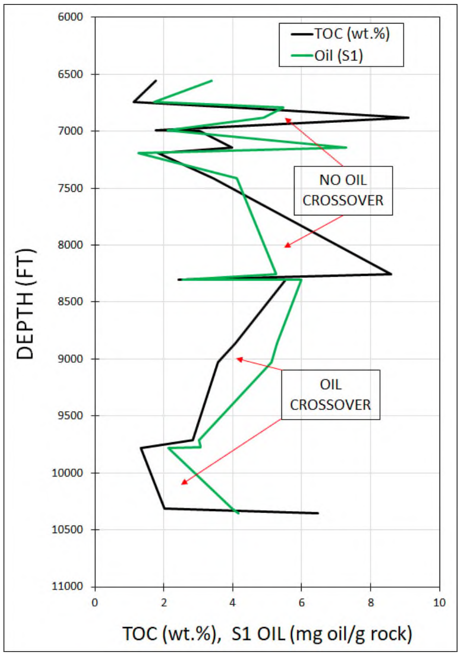
Total Oil = $(S1_{WR} - S1_{extracted\ rock}) + (S2_{whole\ rock} - S2_{extracted\ rock}) + E.L.$

Evaporative Losses = S1 x (GC Fingerprint produced oil / GC Fingerprint of extracted oil)

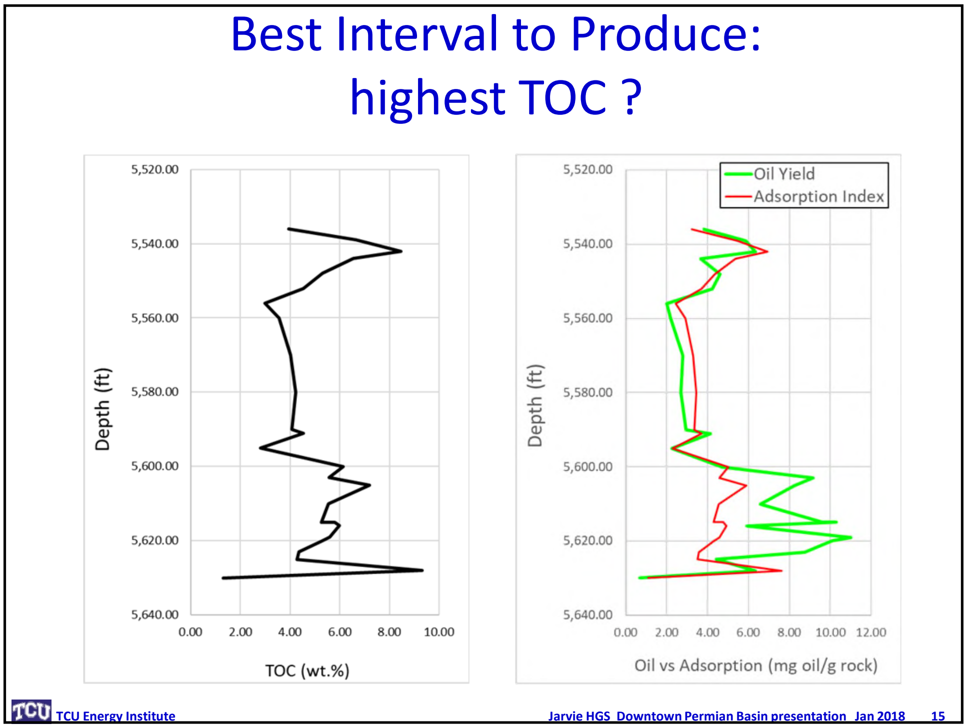
- The more organic-rich reservoir, E.L. is lower (depending on handling)
- The more organic-lean reservoir, E.L. is higher

Wolfcamp Oil Crossover

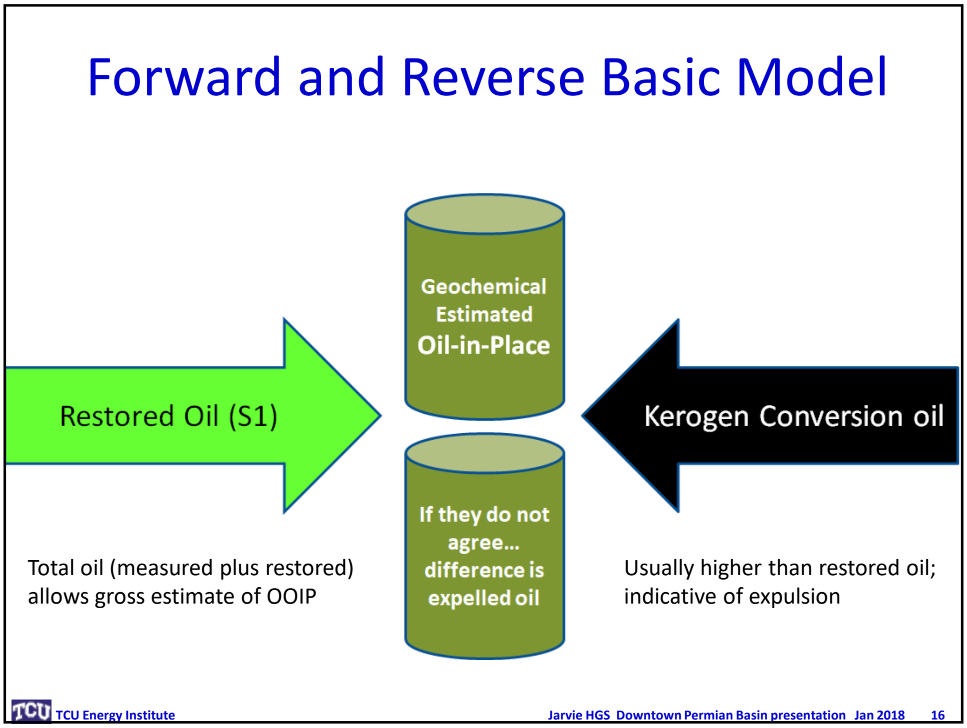
Data from Jarvie et al. (2001)



High TOC and even high oil contents are not necessarily indicative of producible oil. Excess oil relative to TOC is necessary to exceed sorptive capacity of kerogen, bitumen and rock matrix



Best Interval to Produce: highest TOC ?



Forward and Reverse Basic Model

Geochemical Estimated Oil-in-Place

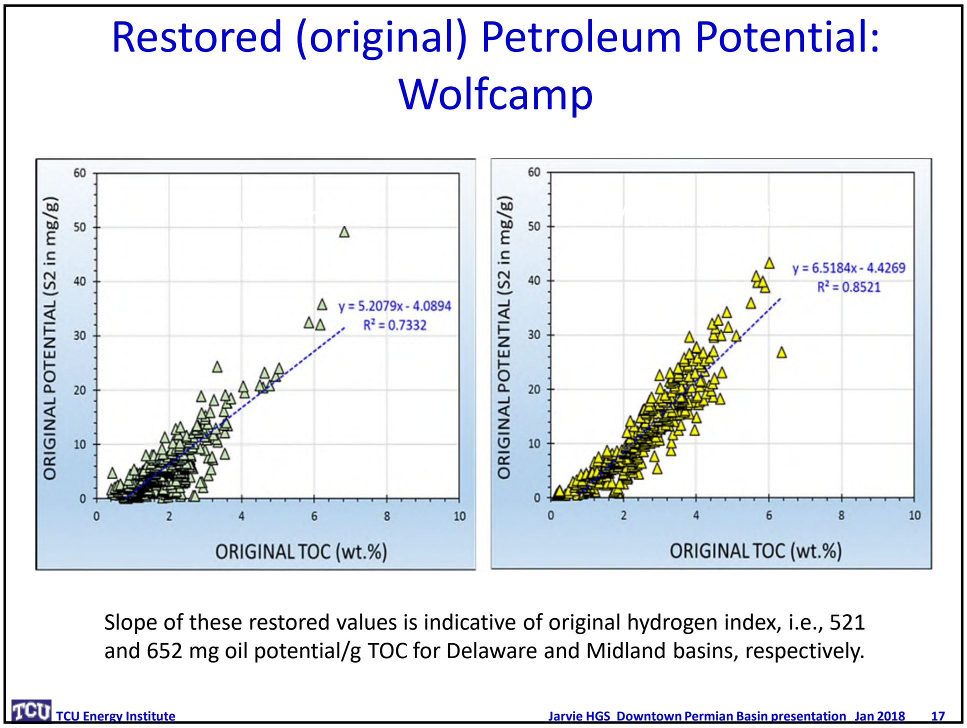
Restored Oil (S1)

Kerogen Conversion oil

If they do not agree… difference is expelled oil

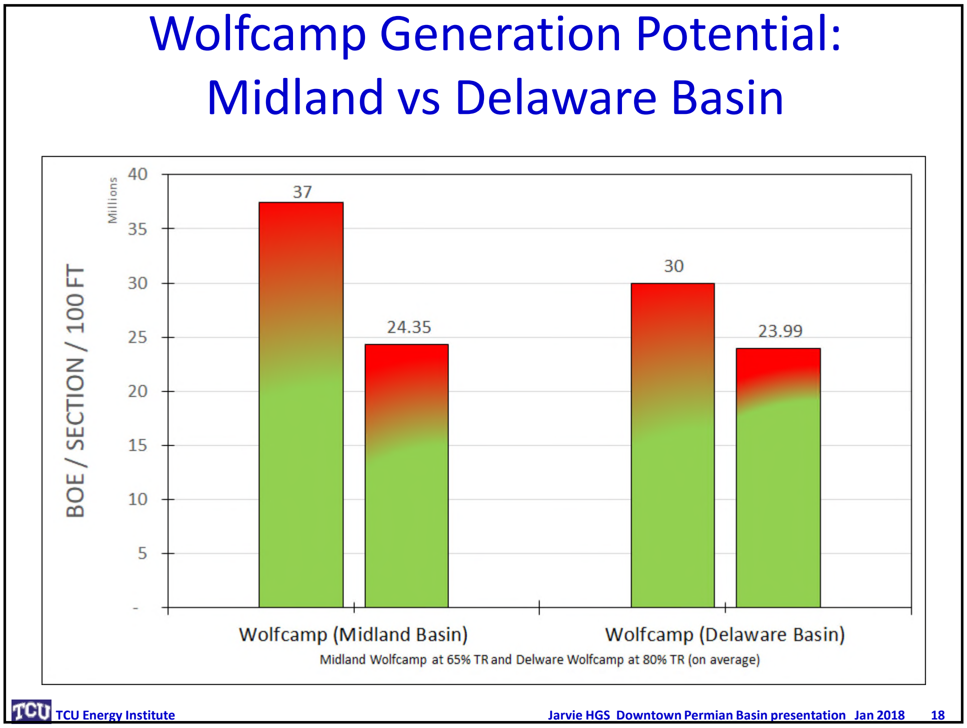
Total oil (measured plus restored) allows gross estimate of OOIP

Usually higher than restored oil; indicative of expulsion



Restored (original) Petroleum Potential: Wolfcamp

Slope of these restored values is indicative of original hydrogen index, i.e., 521 and 652 mg oil potential/g TOC for Delaware and Midland basins, respectively.



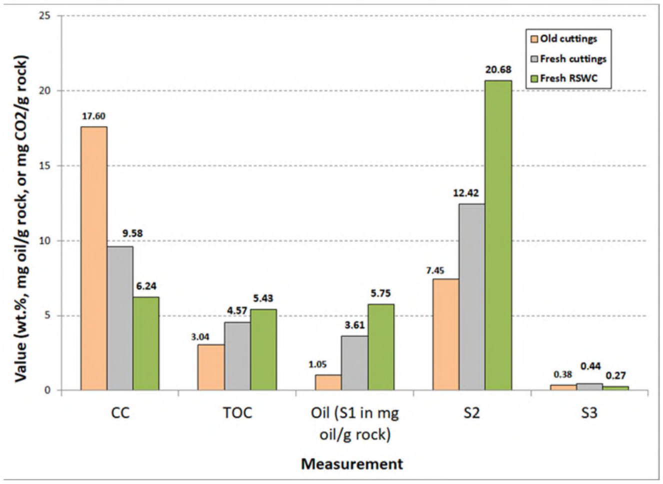
Wolfcamp Generation Potential: Midland vs Delaware Basin

Midland Wolfcamp at 65% TR and Delware Wolfcamp at 80% TR (on average)

Comparison of Archived vs Fresh Cuttings

Samples from an offset well and compared to the archived cuttings from the original well

(Data courtesy of Gunn Oil Corp.)

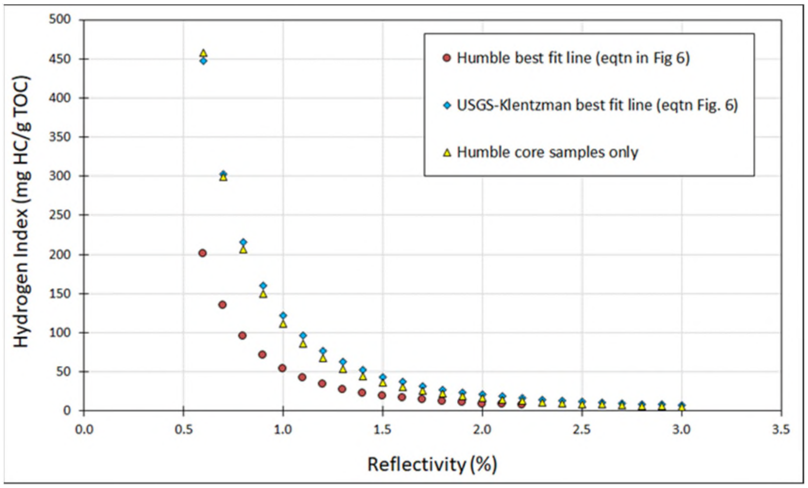


Archived cuttings are hypothesized to be oxidized which lowers the pyrolysis effluent concentration yielding lower values of TOC and S2 due to increased CO_2 in effluent.

Ref: Jarvie, 2017

Impact of Sample Quality

While the Humble cuttings data shows variation from the fresh analysis of Barnett Shale, the Humble core data agrees. Cores were also archived but appear to be relatively unaffected by a decade of storage.



Refs: Humble Geochemical Ft. Worth Basin Barnett Shale (1995); Lewan and Pawlewicz, 2017

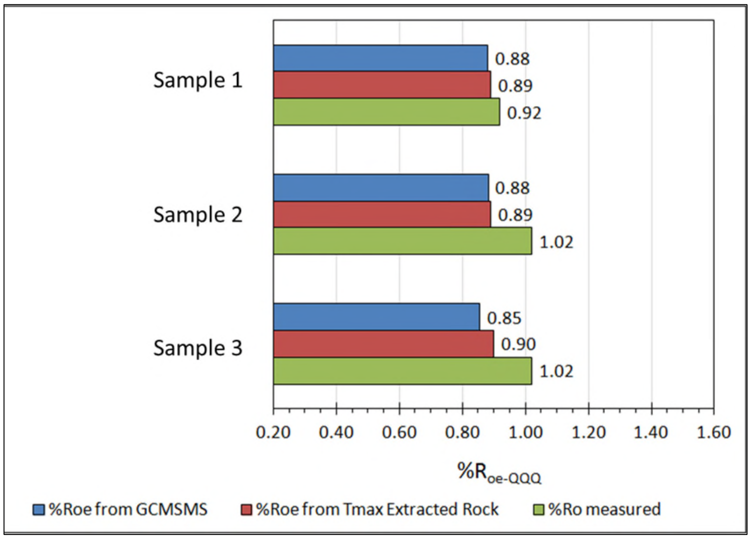
Thermal Maturity Techniques

Techniques for Evaluation of Thermal Maturity					
Method	**Industry Standard**	**Variability**	**Range**	**Price**	**Delivery**
⇨ Vitrinite reflectance	X	High	complete	Mod	Slow
Kerogen color		Mod	oil zone	Mod	Slow
⇨ Rock-Eval Tmax	X	High	oil zone	Low	Fast
Kerogen conversion ratio		Low	complete	Low	Fast
⇨ Dry gas ratio		Low	complete	Low	Fast
⇨ Carbon isotopes	x	Low	complete	High	Mod
Pyrolysis GC MS			oil zone	High	Mod
Biomarkers (standard approach)	x	Mod	oil zone	High	Slow
⇨ Aromatic hydrocarbons			complete	High	Fast
⇨ GC fingerprinting		Mod	complete	High	Fast

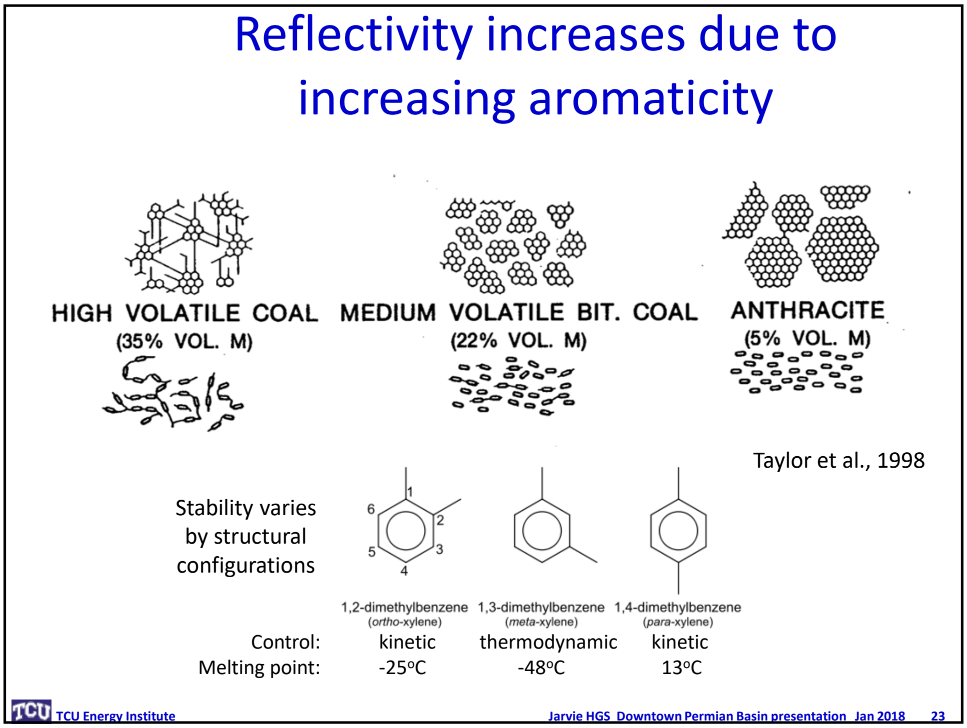
⇨ Discussed in presentation

Thermal Maturity Assessments: which is correct?

The most difficult task for an organic petrologist is to find indigenous woody plant debris, i.e., vitrinite particles, in a deep marine setting where most unconventional shales were deposited and preserved.



Maturity is a risking process and requires accurate and reproducible data for correlation to production.



Reflectivity increases due to increasing aromaticity

HIGH VOLATILE COAL
(35% VOL. M)

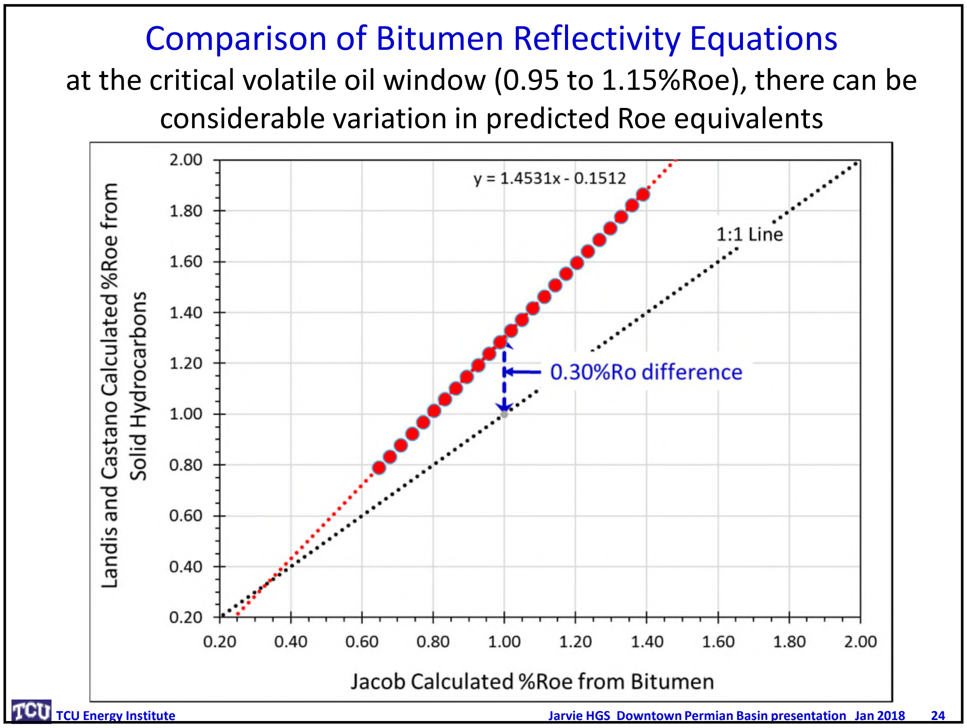
MEDIUM VOLATILE BIT. COAL
(22% VOL. M)

ANTHRACITE
(5% VOL. M)

Taylor et al., 1998

Stability varies
by structural
configurations

	1,2-dimethylbenzene (*ortho*-xylene)	1,3-dimethylbenzene (*meta*-xylene)	1,4-dimethylbenzene (*para*-xylene)
Control:	kinetic	thermodynamic	kinetic
Melting point:	-25°C	-48°C	13°C

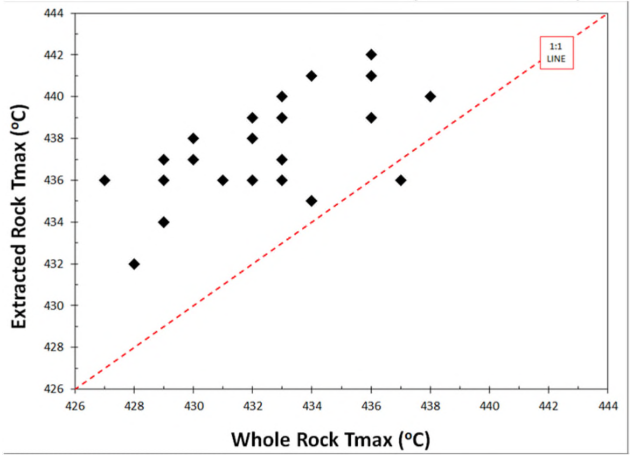


Comparison of Bitumen Reflectivity Equations

at the critical volatile oil window (0.95 to 1.15%Roe), there can be considerable variation in predicted Roe equivalents

Bakken Shale Tmax Data

For the most reliable Tmax data, organic-rich (bitumen-rich) shales must be solvent extracted prior to analysis



This is indicative of how strongly petroleum is sorbed into the kerogen and rock matrix

Comparison of unextracted and extracted samples of Upper Bakken Shale. Tmax values of solvent-extracted rock average 5°C higher Tmax. The average Tmax value for whole rocks is 432°C versus 437°C Tmax for solvent-extracted rock or a calculated equivalent %Roe(Tmax) of 0.62% versus 0.71% (using the 2001 equation). This is the difference between immature and early mature Bakken Shale. Modified from Jarvie et al. (2011).

Tmax to %Ro Correlation Data

Reference:	Hatch et al. (1984)	Espitalie et al., 1985	Delvaux et al. (1990)	Duppenbecker, 1992	Basken and Peters (1992)	Veld et al. (1993)	Gentzis et al. (1993)	Petersen (2002)	Cornford et al. (2002)	Petersen (2006)
Basin or area:	Kansas	Paris	various	Lower Saxony	Santa Maria	The Netherlands	Canadian Arctic	various	various	various
Age:	Pennsylvanian					Westphalian		Carbon.-Tertiary	worldwide database	worldwide database
Samples:	Cherokee coals	Toarcian Shale	Type I, II, III, IV, coals	Posidonia Shale	Monterey Shale	coals	marine/non-marine	humic coals		humic coals
Count:	n=19	n=8	n=21	n=12	n=4	n=402	(est. linear fit)	n=89	n=unknown	n=494
%Roe(Tmax):	0.0122*Tmax-4.7572	0.0131*Tmax-4.9689	0.0179*Tmax-7.1178	0.0129*Tmax-5.0335	0.0161*Tmax-6.377	0.0137*Tmax-5.1365	0.0210*Tmax-8.5133	(Tmax-398.39)/51.96	0.01857*Tmax-7.4514	(Tmax-391.92)/58.97
R^2:	0.86	0.96	0.86	0.88	0.99	0.89	na	0.96	0.74	0.87
Tmax (°C)	%Roe	%Roe	%Roe	%Roe	%Roe	%Roe		%Roe	%Roe	%Roe
430	0.49	0.66	0.58	0.51	0.55	0.75	0.52	0.61	0.53	0.65
435	0.55	0.73	0.67	0.58	0.63	0.82	0.62	0.70	0.63	0.73
440	0.61	0.80	0.76	0.64	0.71	0.89	0.73	0.80	0.72	0.82
445	0.67	0.86	0.85	0.71	0.79	0.96	0.83	0.90	0.81	0.90
450	0.73	0.93	0.94	0.77	0.87	1.03	0.94	0.99	0.91	0.98
455	0.79	0.99	1.03	0.84	0.95	1.10	1.04	1.09	1.00	1.07
460	0.85	1.06	1.12	0.90	1.03	1.17	1.15	1.19	1.09	1.15
465	0.92	1.12	1.21	0.97	1.11	1.23	1.25	1.28	1.18	1.24
470	0.98	1.19	1.30	1.03	1.19	1.30	1.36	1.38	1.28	1.32
475	1.04	1.25	1.38	1.09	1.27	1.37	1.46	1.47	1.37	1.41
480	1.10	1.32	1.47	1.16	1.35	1.44	1.57	1.57	1.46	1.49
485	1.16	1.38	1.56	1.22	1.43	1.51	1.67	1.67	1.56	1.58

Reference:	Wüst et al. (2012)	Lee, 2015	Lee, 2015	Hackley and Baugher (2016)	Drozd and Knowles (2017)	Drozd et al. (2017)	Lewan and Pawlewicz (2017)	Lewan and Kotarba (2014)	Humble 2003 (in L&P, 2017)	Jarvie et al. (2001)
Basin or area:	W. Canadian Sed.	various	various		10 basins in USA	Black Warrior	Ft. Worth		Ft. Worth	Ft. Worth
Age:	(Trican data)	China, Taiwan	China, Taiwan							
Samples:	Duvernay	coals, coaly shales	coals, coaly shales	coal (HP results)*		Floyd Shale	Barnett Shale	humic coals	Barnett Shale (core)	Barnett Shale (core)
Count:	n > 1000	n=608	n=580	n=6	n=1375	n=245	n=57	n=35	n=4	n=79
%Roe(Tmax):	0.0149*Tmax-5.85	0.0188*Tmax-7.5582	0.0180*Tmax-7.1992	0.0178*Tmax-6.8527	0.0181*Tmax-7.147	0.0154*Tmax-5.972	0.022*Tmax-8.57	0.0103*Tmax-3.785	0.0174*Tmax-6.9523	0.0180*Tmax-7.16
R^2:	na	0.74	0.79	0.98	0.78	na	0.56	0.97	0.99	0.79
Tmax (°C)	%Roe	%Roe	%Roe	%Roe	%Roe	%Roe	%Roe	%Roe		
430	0.56	0.53	0.54	0.80	0.64	0.65	0.89	0.64	0.53	0.58
435	0.63	0.62	0.63	0.89	0.73	0.73	1.00	0.70	0.62	0.67
440	0.71	0.71	0.72	0.98	0.82	0.80	1.11	0.75	0.70	0.76
445	0.78	0.81	0.81	1.07	0.91	0.88	1.22	0.80	0.79	0.85
450	0.86	0.90	0.90	1.16	1.00	0.96	1.33	0.85	0.88	0.94
455	0.93	1.00	0.99	1.25	1.09	1.04	1.44	0.90	0.96	1.03
460	1.00	1.09	1.08	1.34	1.18	1.11	1.55	0.95	1.05	1.12
465	1.08	1.18	1.17	1.42	1.27	1.19	1.66	1.00	1.14	1.21
470	1.15	1.28	1.26	1.51	1.36	1.27	1.77	1.06	1.23	1.3
475	1.23	1.37	1.35	1.60	1.45	1.34	1.88	1.11	1.31	1.39
480	1.30	1.47	1.44	1.69	1.54	1.42	1.99	1.16	1.40	1.48
485	1.38	1.56	1.53	1.78	1.63	1.50	2.10	1.21	1.49	1.57

Tmax to %Ro Correlation Data

2001: %Roe(Tmax) = 0.0180 x Tmax – 7.16
2018: %Roe(Tmax) = 0.0165 x Tmax – 6.51

	2001 Equation	2018 Equation
Tmax (^{o}C)	%Roe(Tmax)	%Roe(Tmax)
430	0.58	0.58
435	0.67	0.66
440	0.76	0.75
445	0.85	0.83
450	0.94	0.91
455	1.03	0.99
460	1.12	1.08
465	1.21	1.16
470	1.30	1.24
475	1.39	1.32
480	1.48	1.41

Most reliable results for Tmax derived from solvent-extracted rock samples. Preferred solvent for best clean-up of sample is a binary azeotrope of chloroform-methanol.

Full article posted at:

http://www.wildcattechnologies.com/application/files/2515/1680/9032/Dan_Jarvie_Correlation_of_Tmax_and_measured_vitrinite_reflectance.pdf

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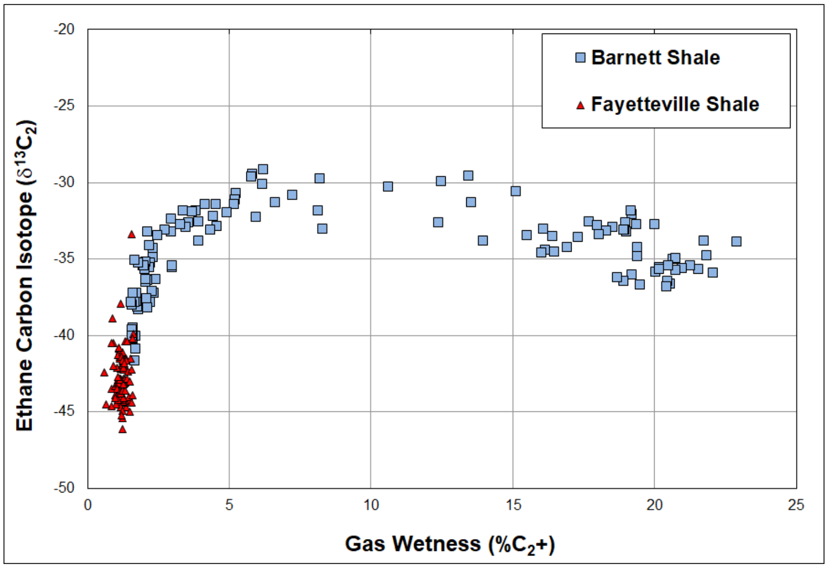
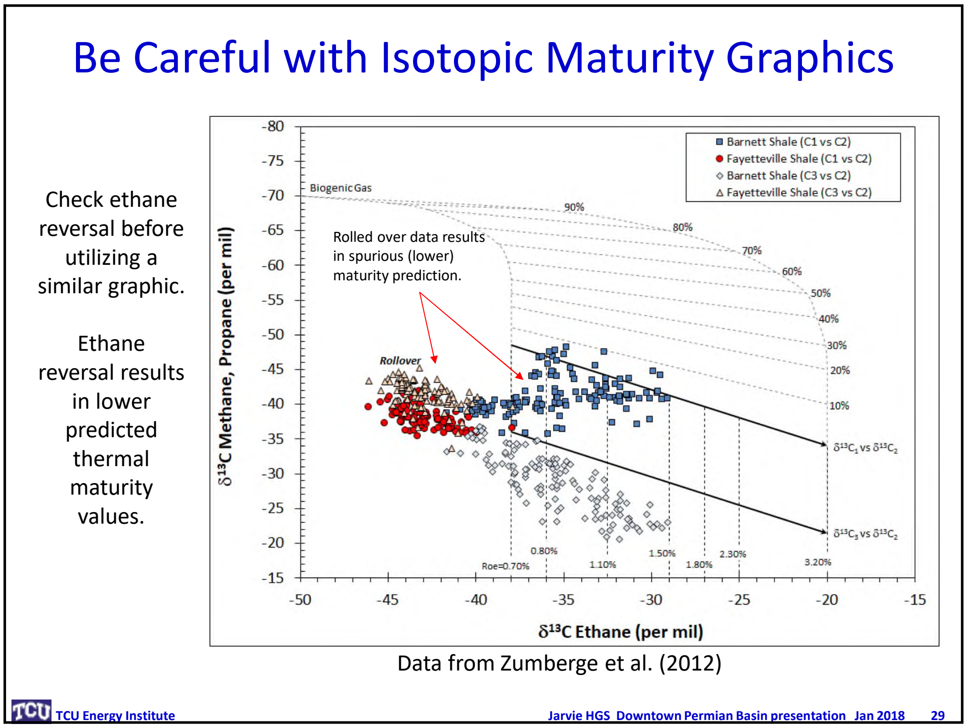
High Maturity Isotopic Reversal:

ethane becomes lighter below ca. 5% gas wetness (ca. 1.5%Ro)



Data from Zumberge et al. (2012)

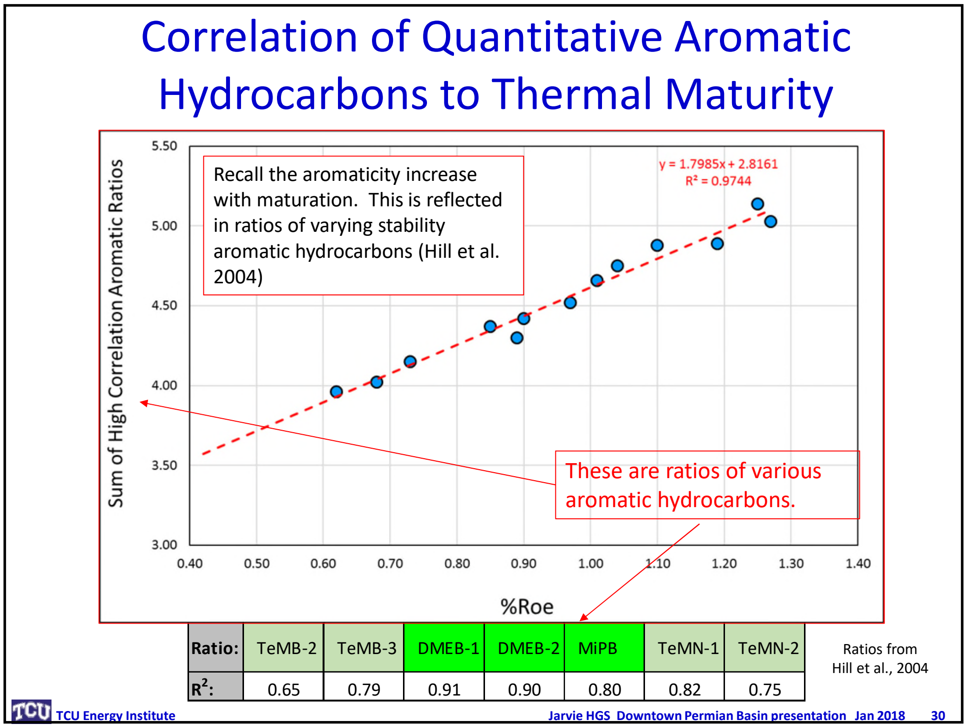


Be Careful with Isotopic Maturity Graphics

Check ethane reversal before utilizing a similar graphic.

Ethane reversal results in lower predicted thermal maturity values.

Data from Zumberge et al. (2012)



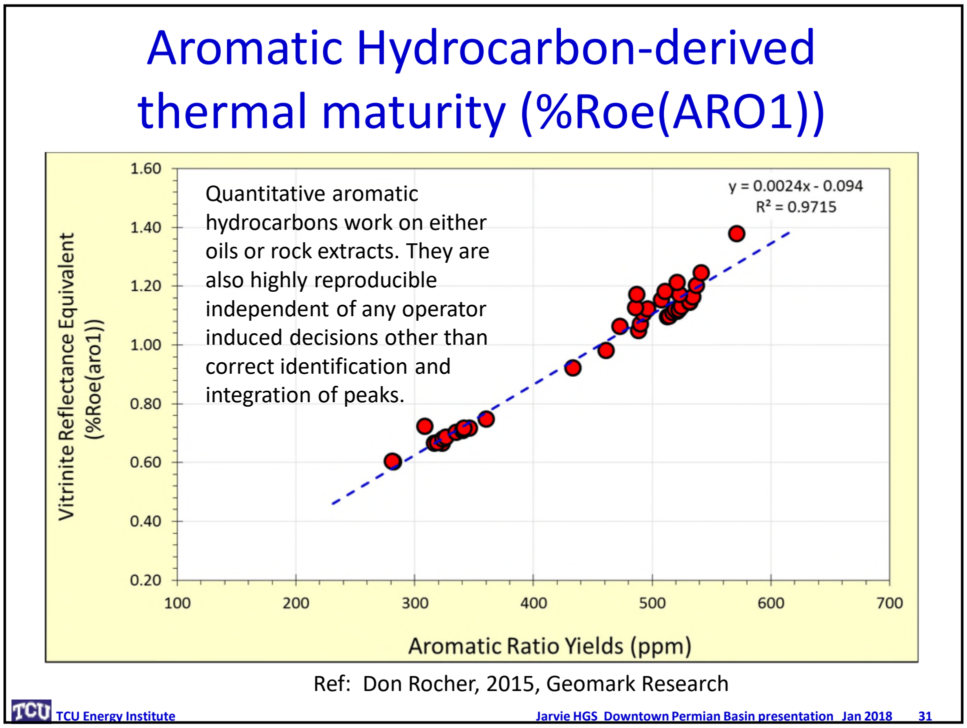
Correlation of Quantitative Aromatic Hydrocarbons to Thermal Maturity

Recall the aromaticity increase with maturation. This is reflected in ratios of varying stability aromatic hydrocarbons (Hill et al. 2004)

These are ratios of various aromatic hydrocarbons.

Ratio:	TeMB-2	TeMB-3	DMEB-1	DMEB-2	MiPB	TeMN-1	TeMN-2
R^2:	0.65	0.79	0.91	0.90	0.80	0.82	0.75

Ratios from Hill et al., 2004



Aromatic Hydrocarbon-derived thermal maturity (%Roe(ARO1))

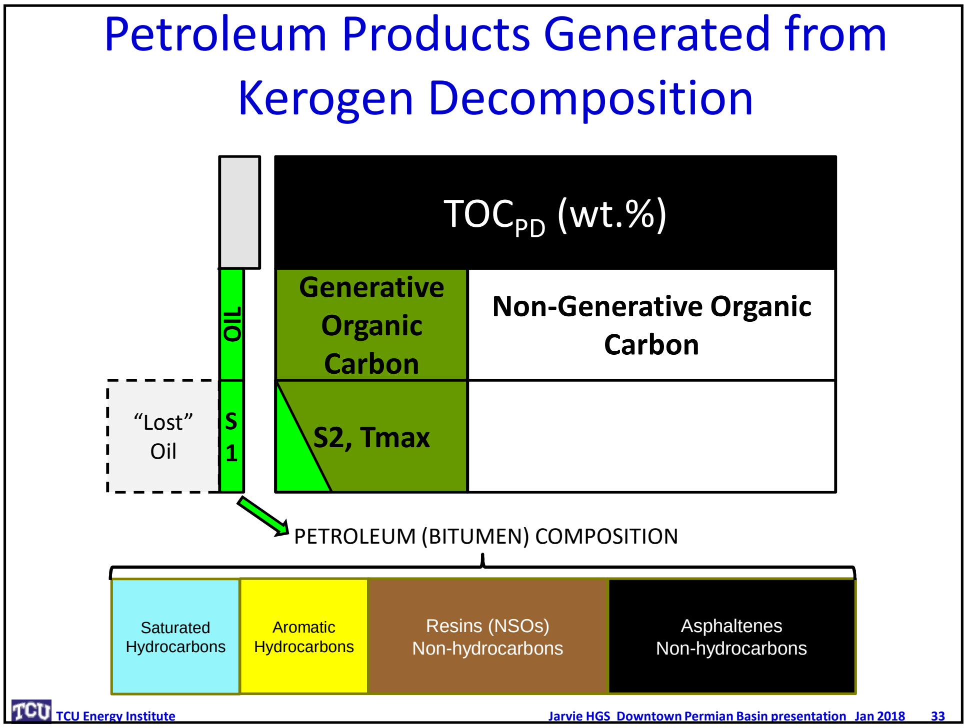
Quantitative aromatic hydrocarbons work on either oils or rock extracts. They are also highly reproducible independent of any operator induced decisions other than correct identification and integration of peaks.

Ref: Don Rocher, 2015, Geomark Research

Secondary Oil (bitumen) Cracking

- Cracking of any product formed from kerogen cracking, i.e., second products
  - Oil cracking = secondary cracking
  - Oil is comprised of:
    - Saturates
    - Aromatics
    - Resins
    - Asphaltenes

Secondary oil cracking is not just saturate fraction cracking so often cited in presentations and papers. The entirety of petroleum cracks yielding lighter oil and more gas through the entire generation windows for oil and gas. This is proven by increasing oil quality (API gravity) and GOR with maturation.



Petroleum Products Generated from Kerogen Decomposition

TOC$_{PD}$ (wt.%)

OIL

Generative Organic Carbon

Non-Generative Organic Carbon

"Lost" Oil

S1

S2, Tmax

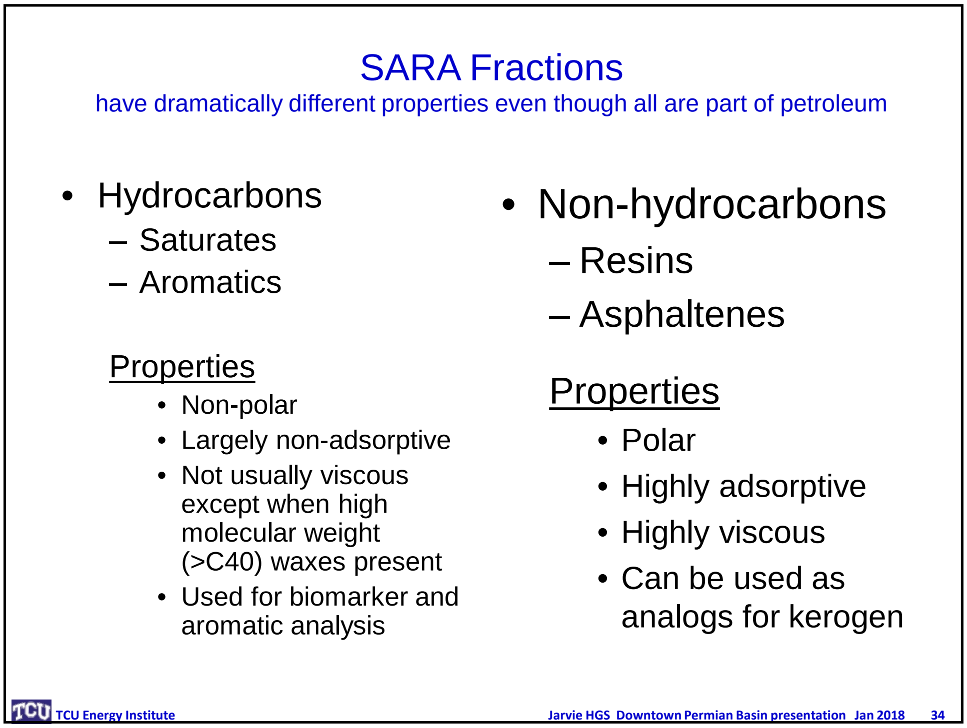
PETROLEUM (BITUMEN) COMPOSITION

Saturated Hydrocarbons

Aromatic Hydrocarbons

Resins (NSOs) Non-hydrocarbons

Asphaltenes Non-hydrocarbons



SARA Fractions

have dramatically different properties even though all are part of petroleum

- Hydrocarbons
  - Saturates
  - Aromatics

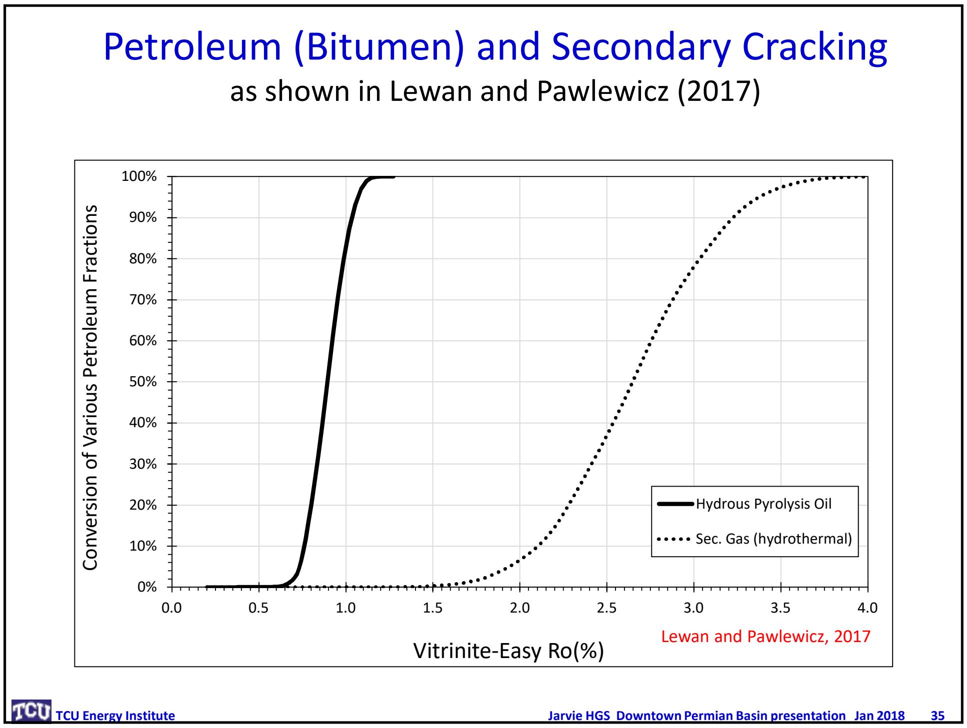
Properties

- Non-polar
- Largely non-adsorptive
- Not usually viscous except when high molecular weight (>C40) waxes present
- Used for biomarker and aromatic analysis

- Non-hydrocarbons
  - Resins
  - Asphaltenes

Properties

- Polar
- Highly adsorptive
- Highly viscous
- Can be used as analogs for kerogen



Petroleum (Bitumen) and Secondary Cracking

as shown in Lewan and Pawlewicz (2017)

Lewan and Pawlewicz, 2017

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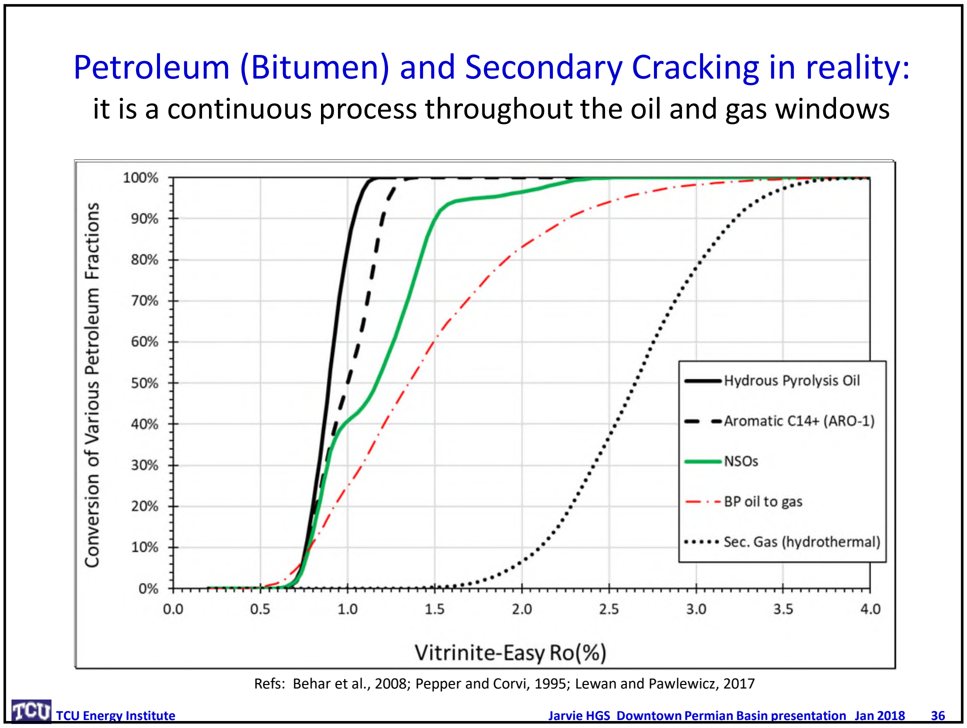

Petroleum (Bitumen) and Secondary Cracking in reality:

it is a continuous process throughout the oil and gas windows

Refs: Behar et al., 2008; Pepper and Corvi, 1995; Lewan and Pawlewicz, 2017

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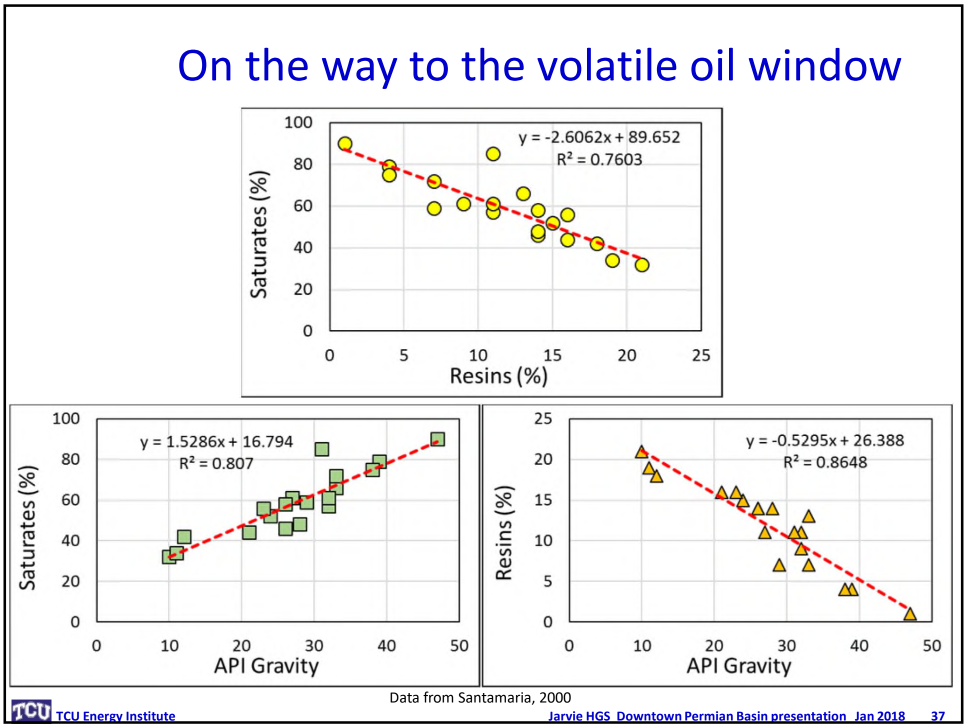

On the way to the volatile oil window

Data from Santamaria, 2000

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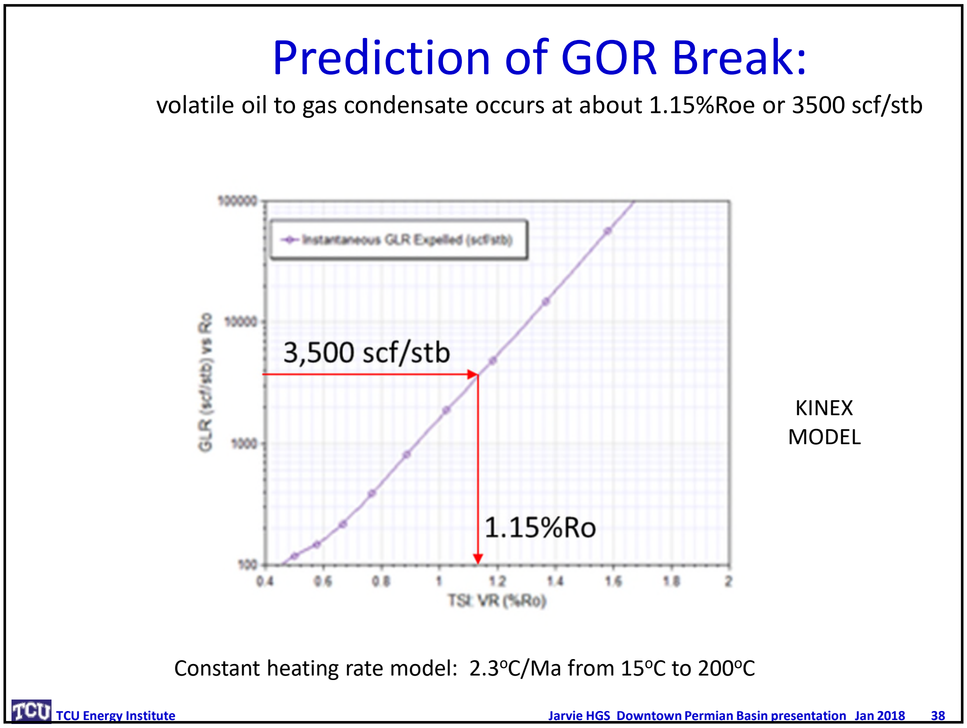

Prediction of GOR Break:

volatile oil to gas condensate occurs at about 1.15%Roe or 3500 scf/stb

KINEX
MODEL

Constant heating rate model: 2.3°C/Ma from 15°C to 200°C

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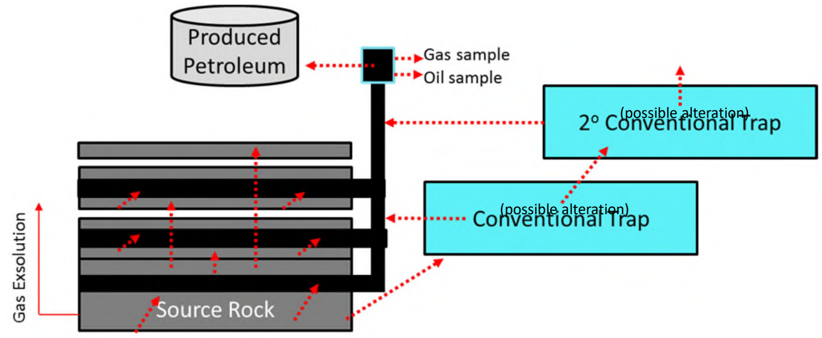
Petroleum Systems

Retention, Expulsion, Migration, and Fractionation

Fractionation occurs on all petroleum movement whether natural or induced



Produced Petroleum

Gas sample

Oil sample

2° Conventional Trap

(possible alteration)

Conventional Trap

(possible alteration)

Gas Exsolution

Source Rock

Wettability / Cracking

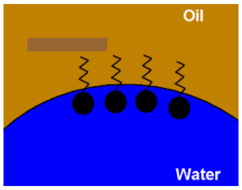
of resins and asphaltenes

Such bonding includes within organic matter both kerogen and petroleum but also water wet inorganic matrices

Hydrogen Bonding enhanced in:

- -OH
- -SH

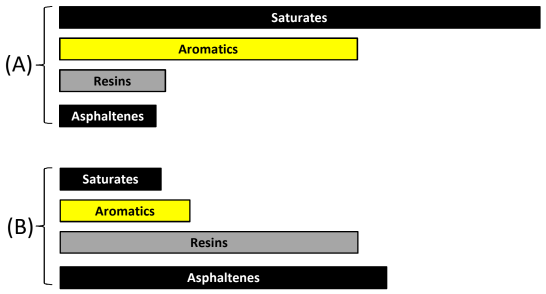
Such bonding allows resins to weakly bond to water.



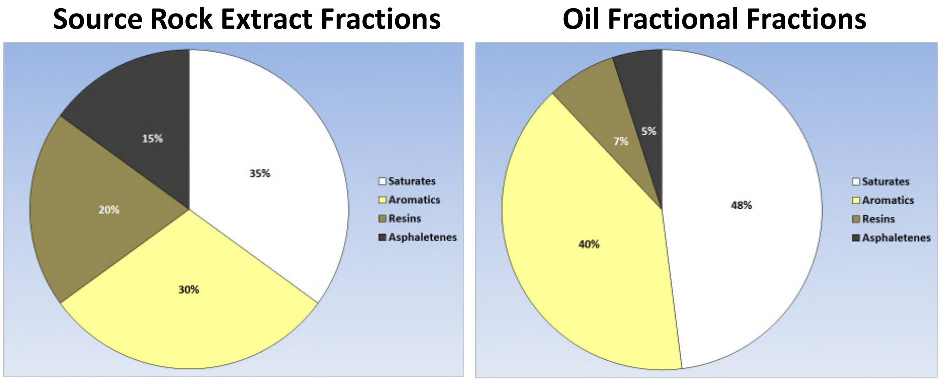
Mobility and Expulsion Fractionation

Mobility results in higher amounts of saturates and aromatics in expulsion

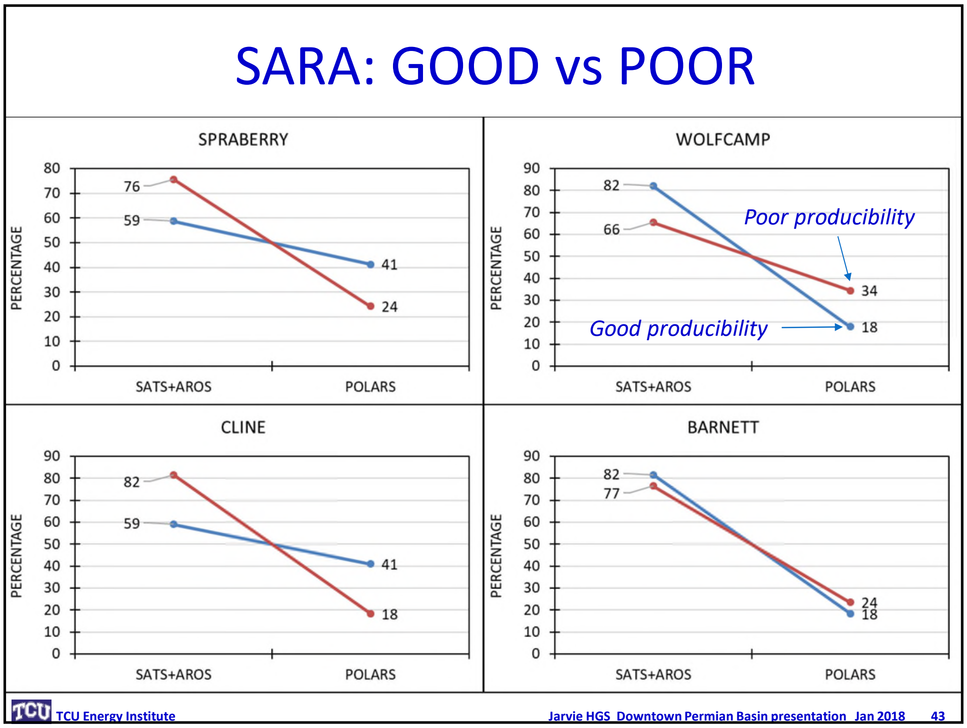
Post-Expulsion fractionation of Petroleum in source rock



Comparison of Shale Reservoir Rock to Produced (dead) Oil


Source Rock Extract Fractions

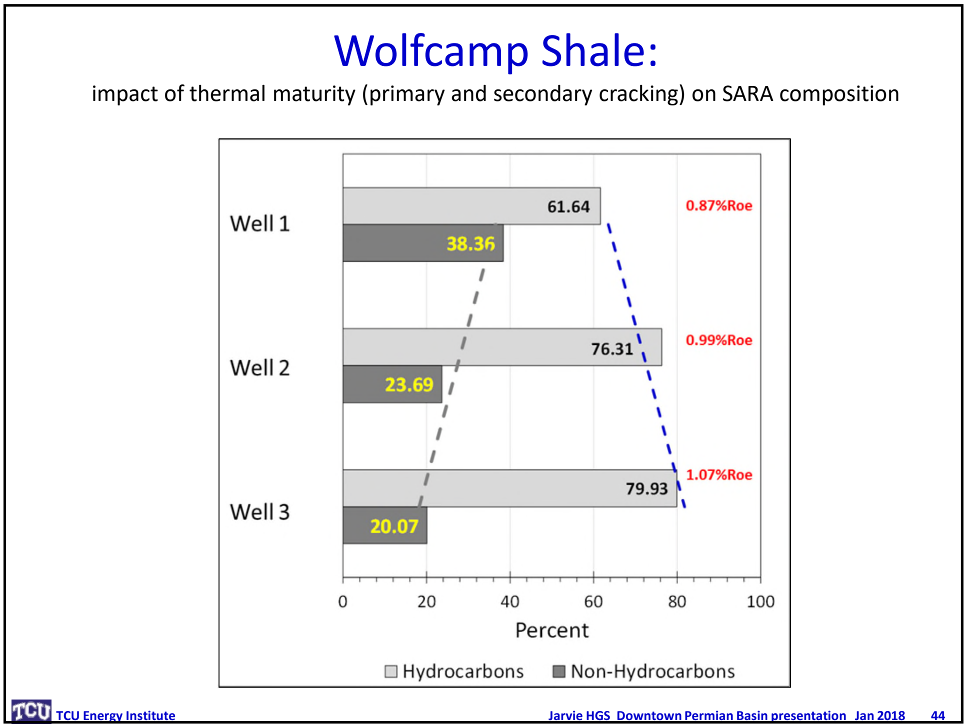
Oil Fractional Fractions



SARA: GOOD vs POOR

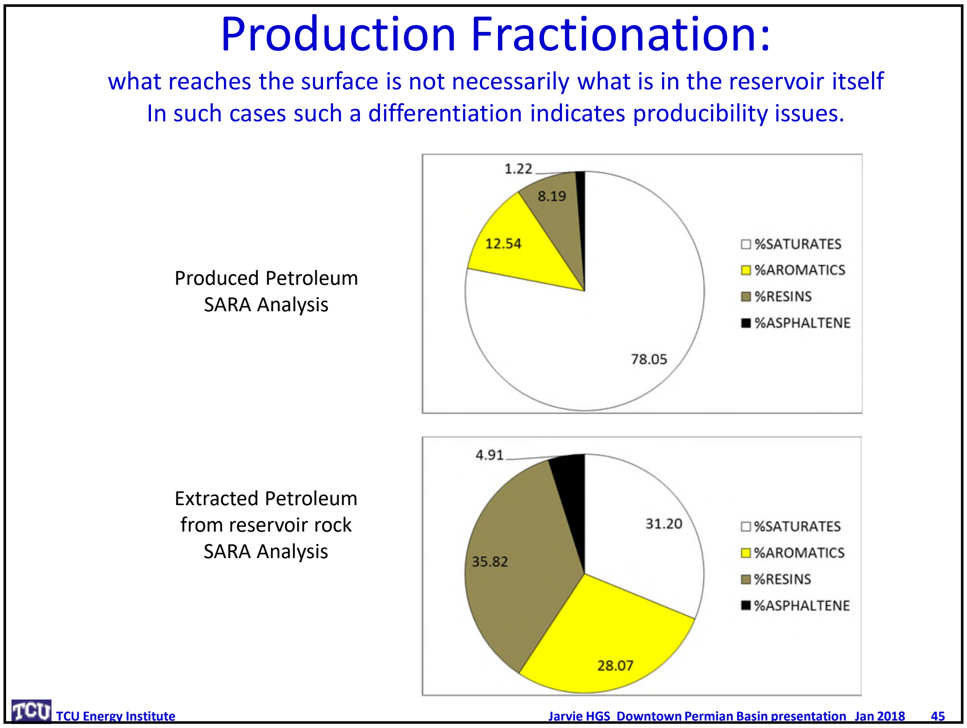
Poor producibility

Good producibility



Wolfcamp Shale:

impact of thermal maturity (primary and secondary cracking) on SARA composition



Production Fractionation:

what reaches the surface is not necessarily what is in the reservoir itself
In such cases such a differentiation indicates producibility issues.

Produced Petroleum
SARA Analysis

Extracted Petroleum
from reservoir rock
SARA Analysis

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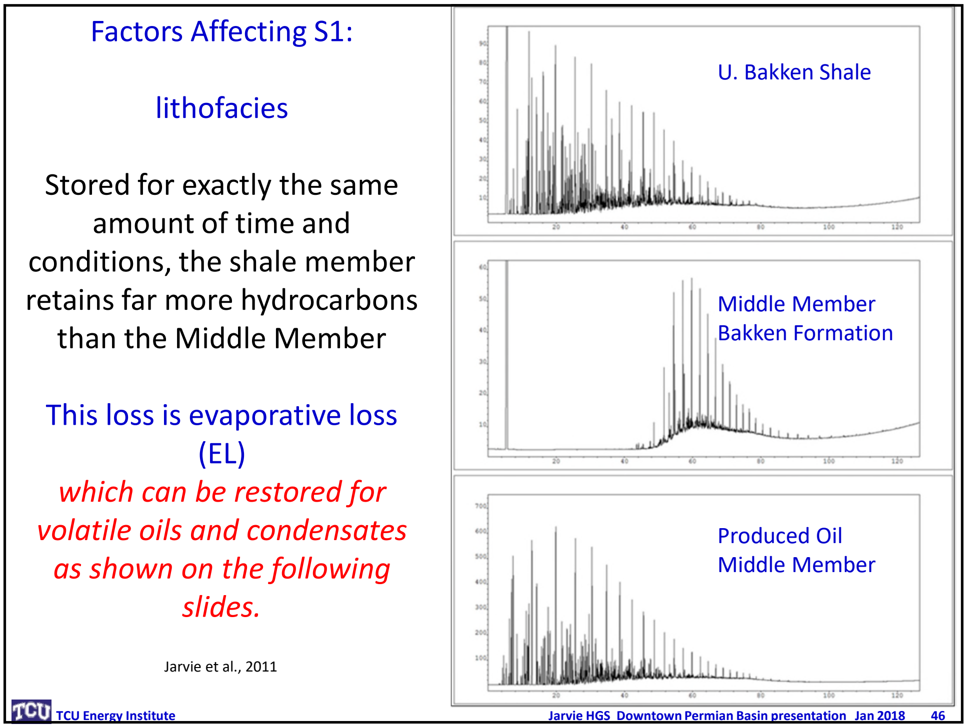

Factors Affecting S1:

lithofacies

Stored for exactly the same amount of time and conditions, the shale member retains far more hydrocarbons than the Middle Member

This loss is evaporative loss (EL)

which can be restored for volatile oils and condensates as shown on the following slides.

Jarvie et al., 2011

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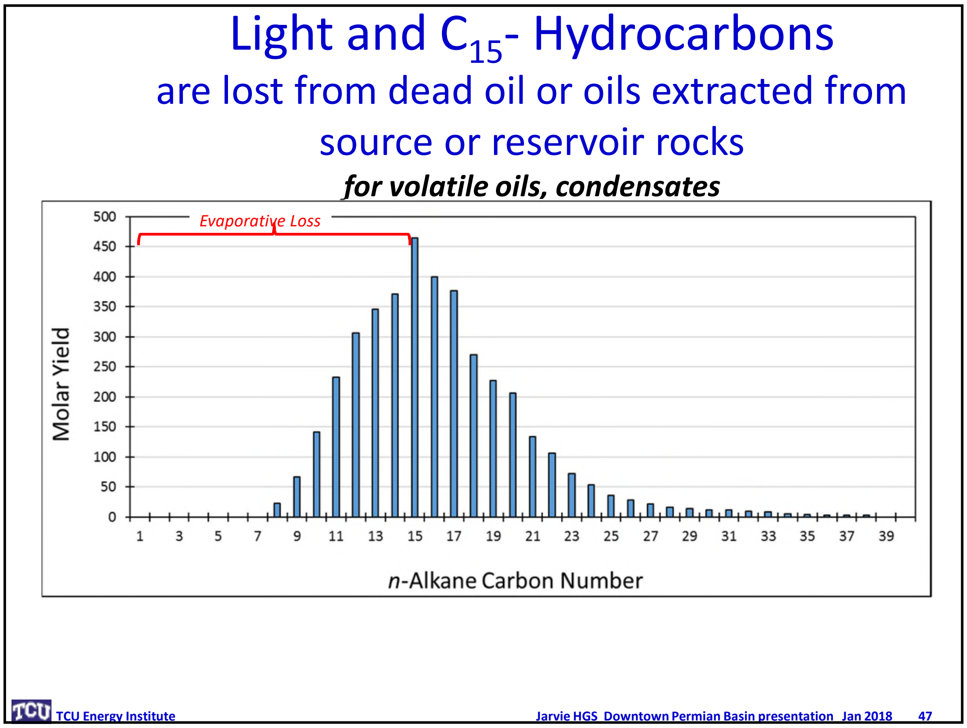
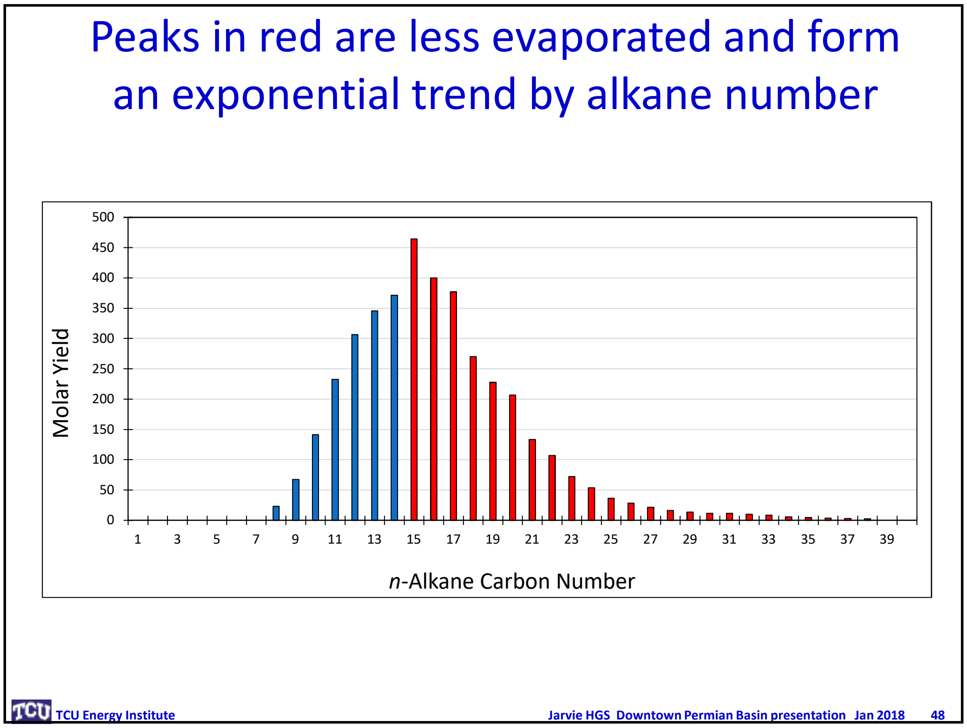


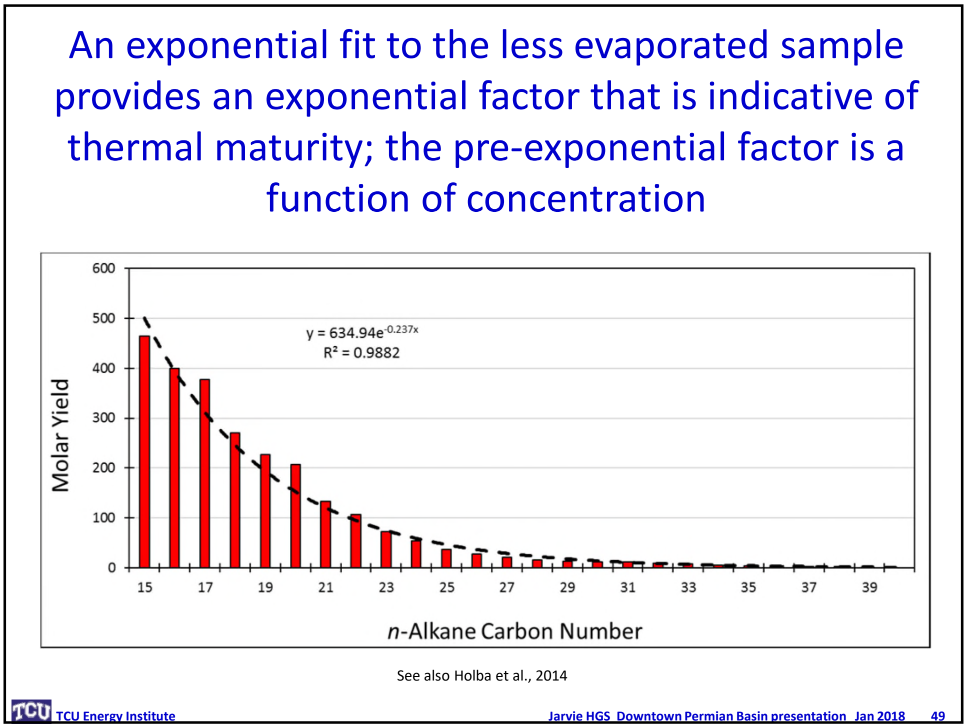
Light and C_{15}- Hydrocarbons

are lost from dead oil or oils extracted from source or reservoir rocks

for volatile oils, condensates



Peaks in red are less evaporated and form an exponential trend by alkane number



An exponential fit to the less evaporated sample provides an exponential factor that is indicative of thermal maturity; the pre-exponential factor is a function of concentration

See also Holba et al., 2014

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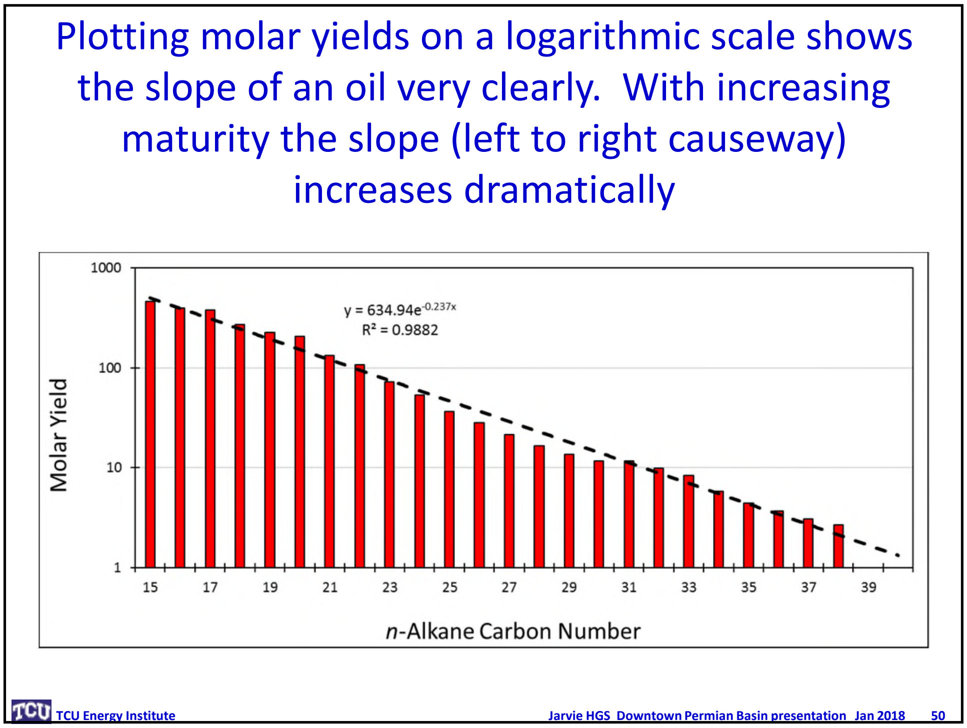

Plotting molar yields on a logarithmic scale shows the slope of an oil very clearly. With increasing maturity the slope (left to right causeway) increases dramatically

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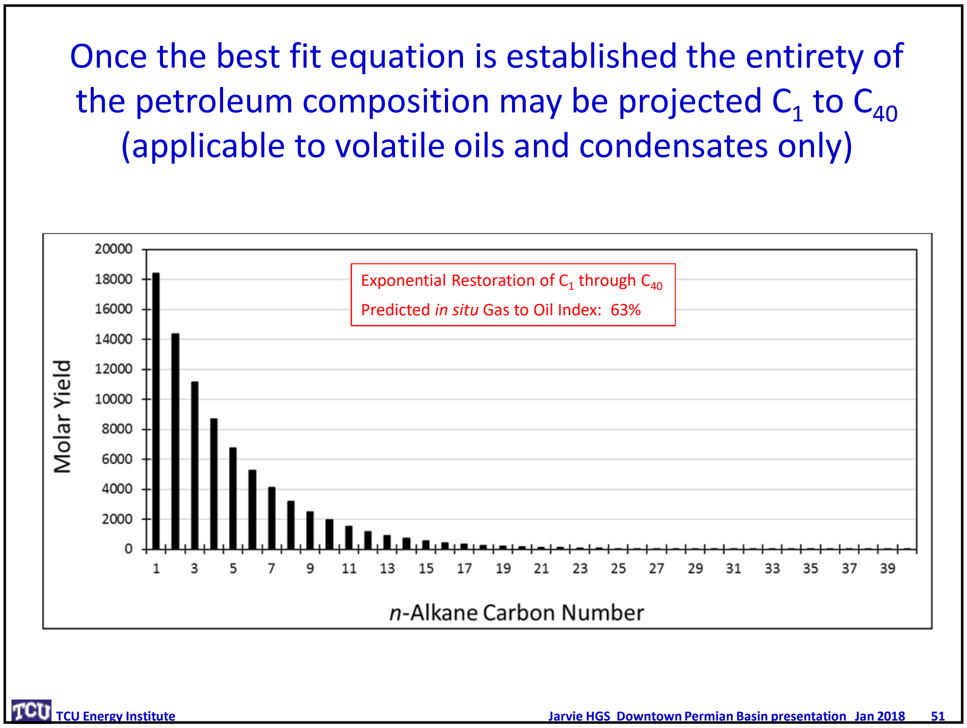

Once the best fit equation is established the entirety of the petroleum composition may be projected C_1 to C_{40} (applicable to volatile oils and condensates only)

Exponential Restoration of C_1 through C_{40}
Predicted *in situ* Gas to Oil Index: 63%

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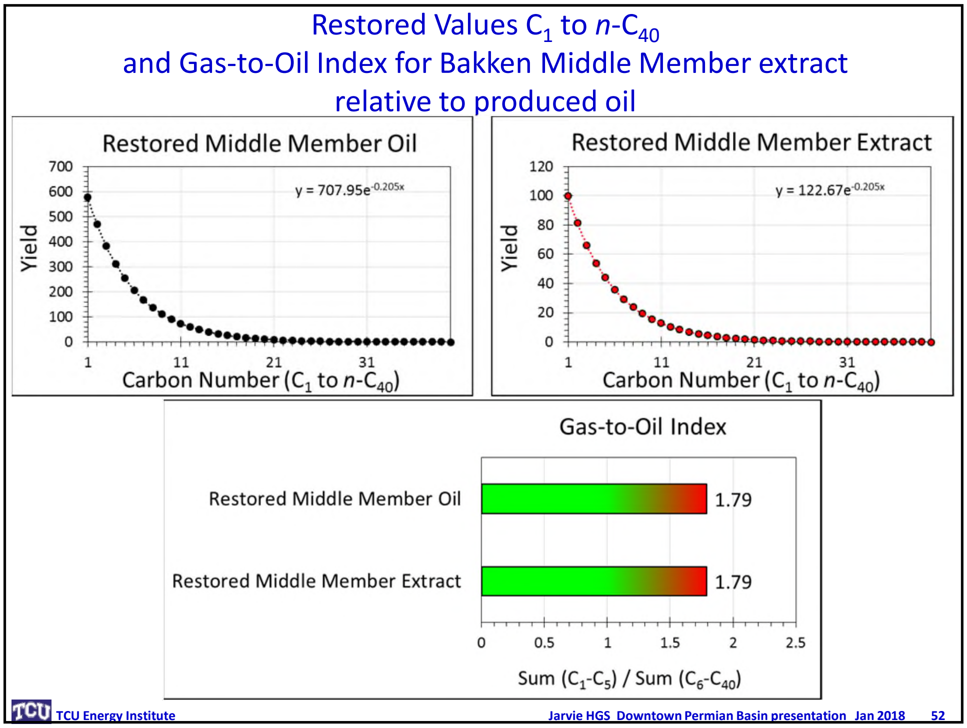

Restored Values C_1 to n-C_{40} and Gas-to-Oil Index for Bakken Middle Member extract relative to produced oil

Restored Middle Member Oil

$y = 707.95e^{-0.205x}$

Restored Middle Member Extract

$y = 122.67e^{-0.205x}$

Gas-to-Oil Index

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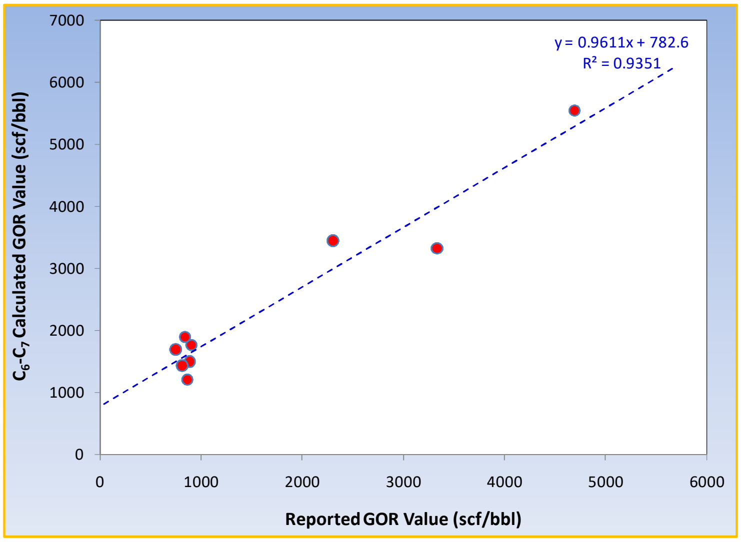
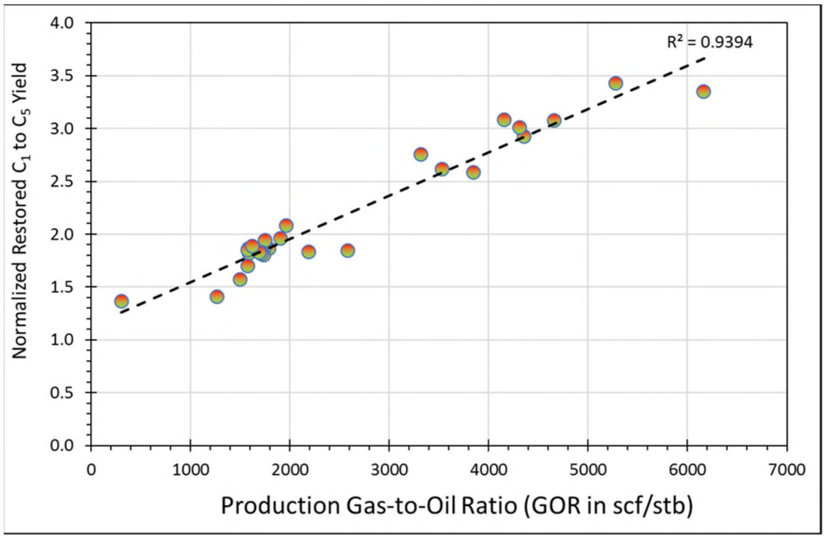
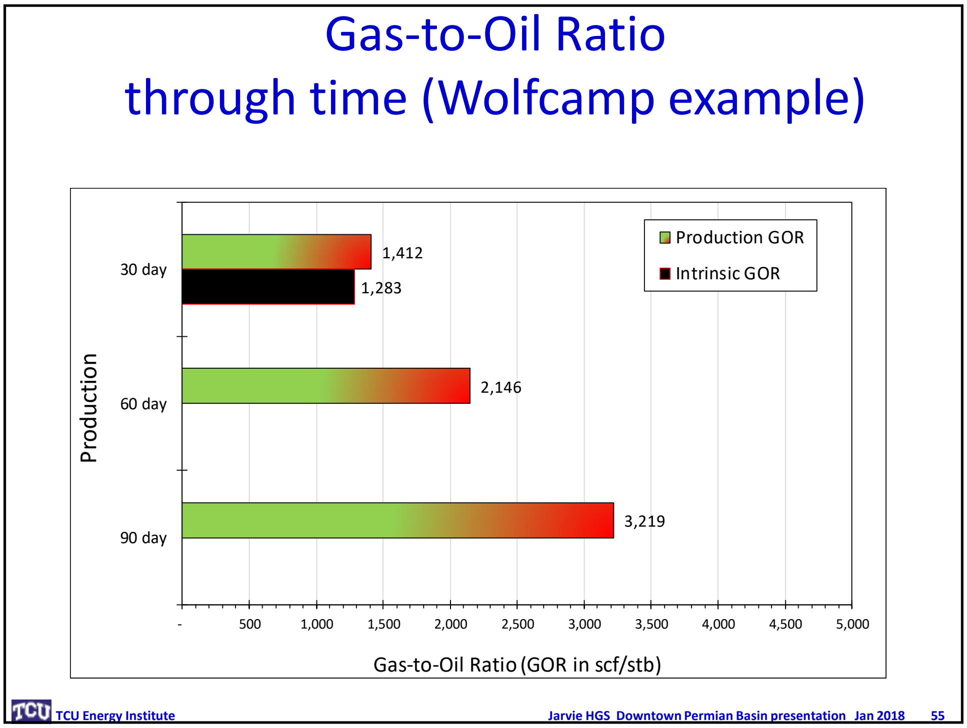
Eagle Ford: Calculated vs Produced Oil GORs



Gechem Predicted vs Reported GOR Permian Basin





Gas-to-Oil Ratio through time (Wolfcamp example)

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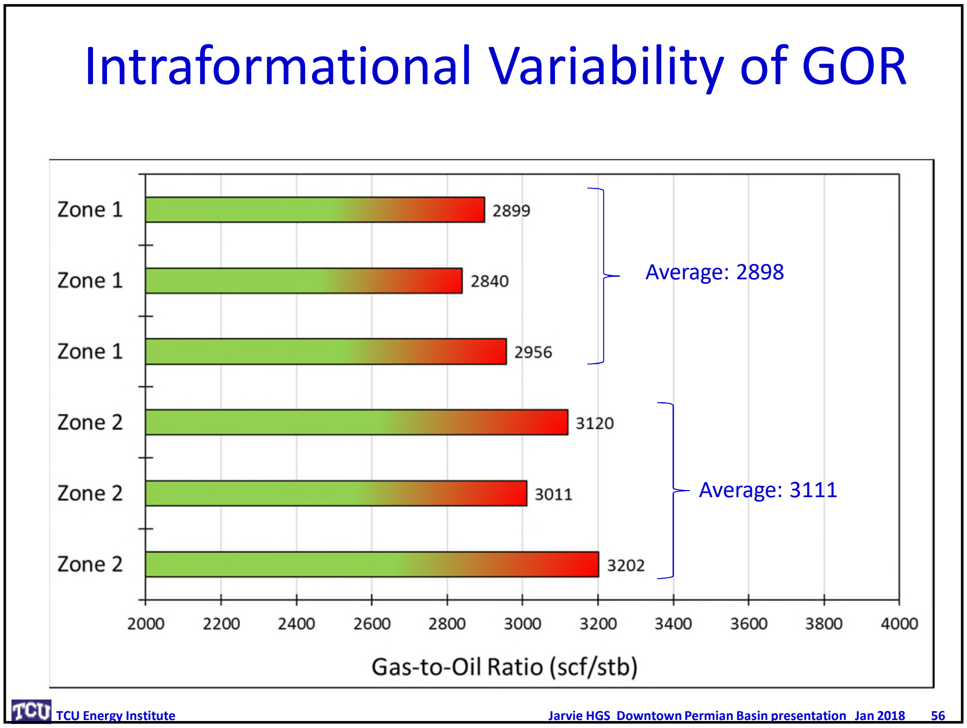

Intraformational Variability of GOR

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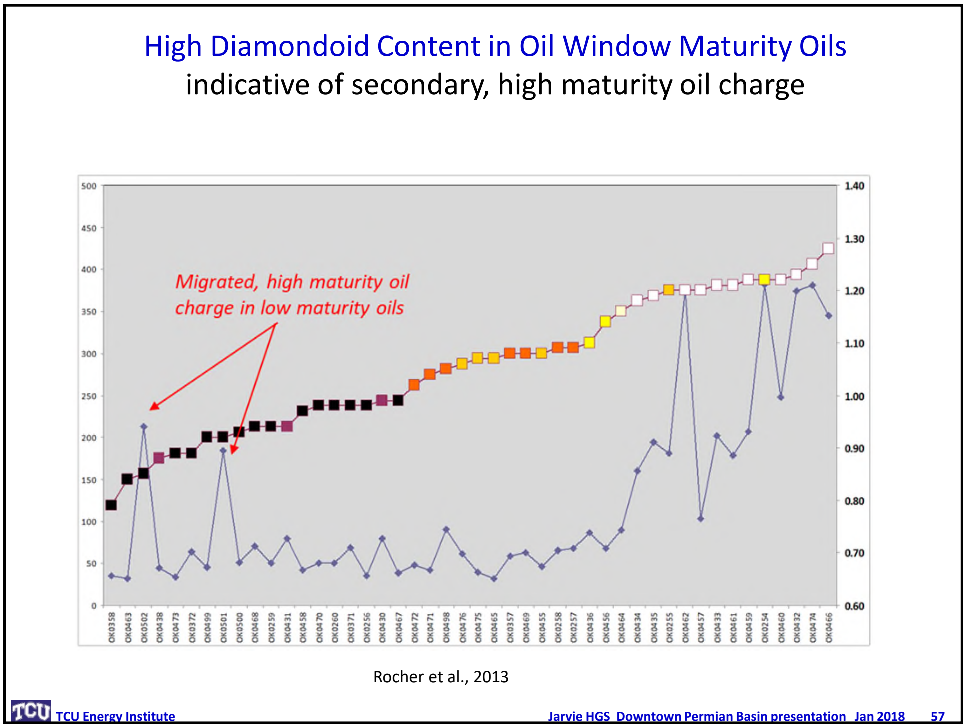
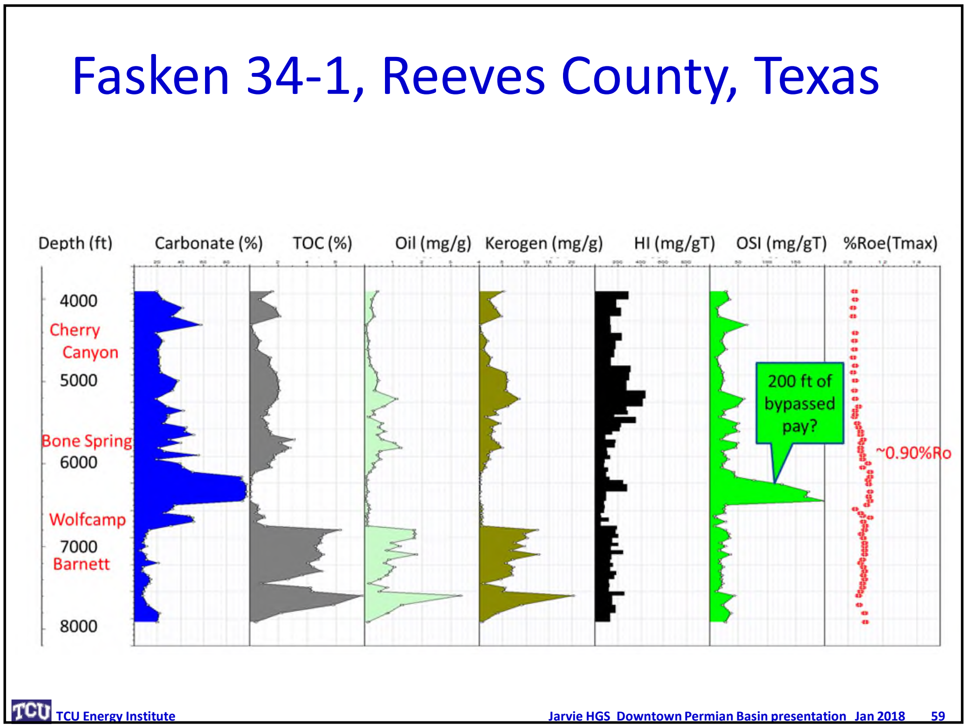


High Diamondoid Content in Oil Window Maturity Oils

indicative of secondary, high maturity oil charge

Rocher et al., 2013

Alpine High



Fasken 34-1, Reeves County, Texas

200 ft of bypassed pay?

~0.90%Ro

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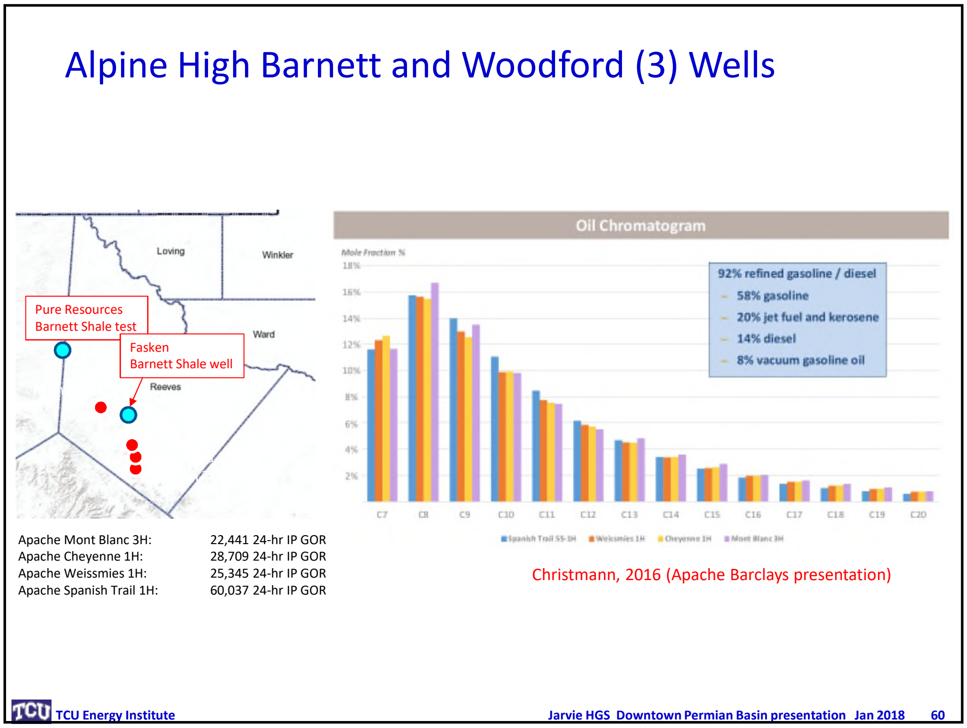

Alpine High Barnett and Woodford (3) Wells

Pure Resources Barnett Shale test

Fasken Barnett Shale well

Apache Mont Blanc 3H:	22,441 24-hr IP GOR
Apache Cheyenne 1H:	28,709 24-hr IP GOR
Apache Weissmies 1H:	25,345 24-hr IP GOR
Apache Spanish Trail 1H:	60,037 24-hr IP GOR

Oil Chromatogram

92% refined gasoline / diesel
- 58% gasoline
- 20% jet fuel and kerosene
- 14% diesel
- 8% vacuum gasoline oil

Christmann, 2016 (Apache Barclays presentation)

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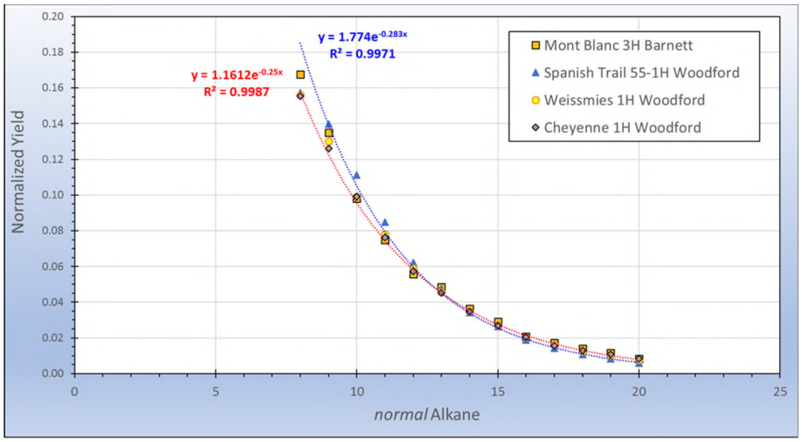
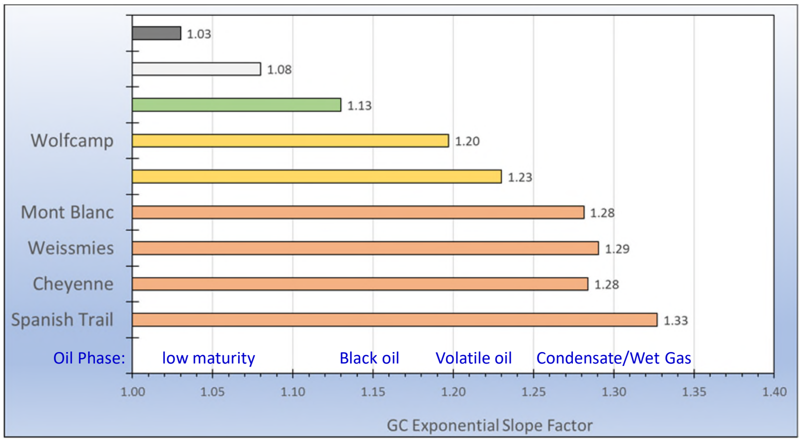
Analysis of GC Histograms from Alpine High: exponential fit of GC histograms



Assessment of Oil Type/Phase: Wolfcamp from central Reeves County, Texas and Alpine High Barnett and Woodford



Synopsis

- Sample Quality may affect results/interpretation
- SARA (saturates, aromatics, resins, and asphaltenes (non-polars vs polars) play an important role in mobility and fractionation
- Quantitative aromatic hydrocarbons is perhaps the best thermal maturity technique
  - Oils and -- Rock extracts
- Restored oil and GOR may be predicted from GC analysis of oils and rock extracts
- Alpine High Barnett and Woodford GORs are predicted from restored GC data

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Thank you.

Comments or Questions?

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