



dig
Dolan Integration Group

Geochemistry for Energy

11 025 Dover Street Unit 800
Westminster, CO 80021
PH 303.531.2050

**Hydrocarbon Gas Composition and Stable Isotopes
Data and Interpretation**

Job #: 22087995
Lab #: DIG-028788
Client: Absaroka Energy and Environmental Solutions
Well Name: SPEAKER 3-13
API #: 05-017-07205

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SAMPLE INFORMATION						COMPLETE GAS ANALYSIS															HYDROCARBON GAS ANALYSIS (normalized to total HC content)										BTU CONTENT*	
Job	Lab	Well	Sample	Sample	Sample	GC	N ₂	O ₂ + Ar	CO ₂	C ₁	C ₂	C ₃	iC ₄	nC ₄	iC ₅	nC ₅	C ₆ +	C ₂ H ₆	He	H ₂	C ₁	C ₂	C ₃	iC ₄	nC ₄	iC ₅	nC ₅	C ₆ +	Total Gas			
Number	Number	Name	Type	Date	Time	Date	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	mol%	mol%	mol%	mol%	mol%	mol%	mol%	mol%	mol%	mol%	BTU/H ³	
22087995	DIG-028788	SPEAKER 3-13 Bradenhead gas	Bradenhead gas	08/10/22	15:45	8/17/2022	29577	397		92.7562	9671	4349	915	907	275	128	154		350	16236	98.3	1.02	0.46	0.10	0.10	0.03	0.03		0.02	999		

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS										Comments	
Job	Lab	Well	Sample	Sample	Sample	Total HC	Wtfracss	C ₁ /C ₂ +C ₃	Balance Ratio	Mass Spec	δ ¹³ C ₁	δ ¹³ C ₂	δ ¹³ C ₃	δ ¹³ C ₄	δ ¹³ C ₅	δ ¹³ C ₆	δ ¹³ C ₇	δ ¹³ C ₈	δ ¹³ CO ₂	δD	
Number	Number	Name	Type	Date	Time	ppm	% C ₁ to C ₈	mol/mol	C ₁ +C ₂ /C ₃ +C ₄	Date	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VPDB	% VSMOW
22087995	DIG-028788	SPEAKER 3-13 Bradenhead gas	Bradenhead gas	08/10/22	15:45	943761	1.7	66.1	142.5	8/26/2022	-62.9	-43.3	-36.5	-33.6	-34.2						-225

Stable isotope results based on multi point laboratory calibration
Values in red represent low signal, interpret with caution

Precision ±13C = 0.5 ‰

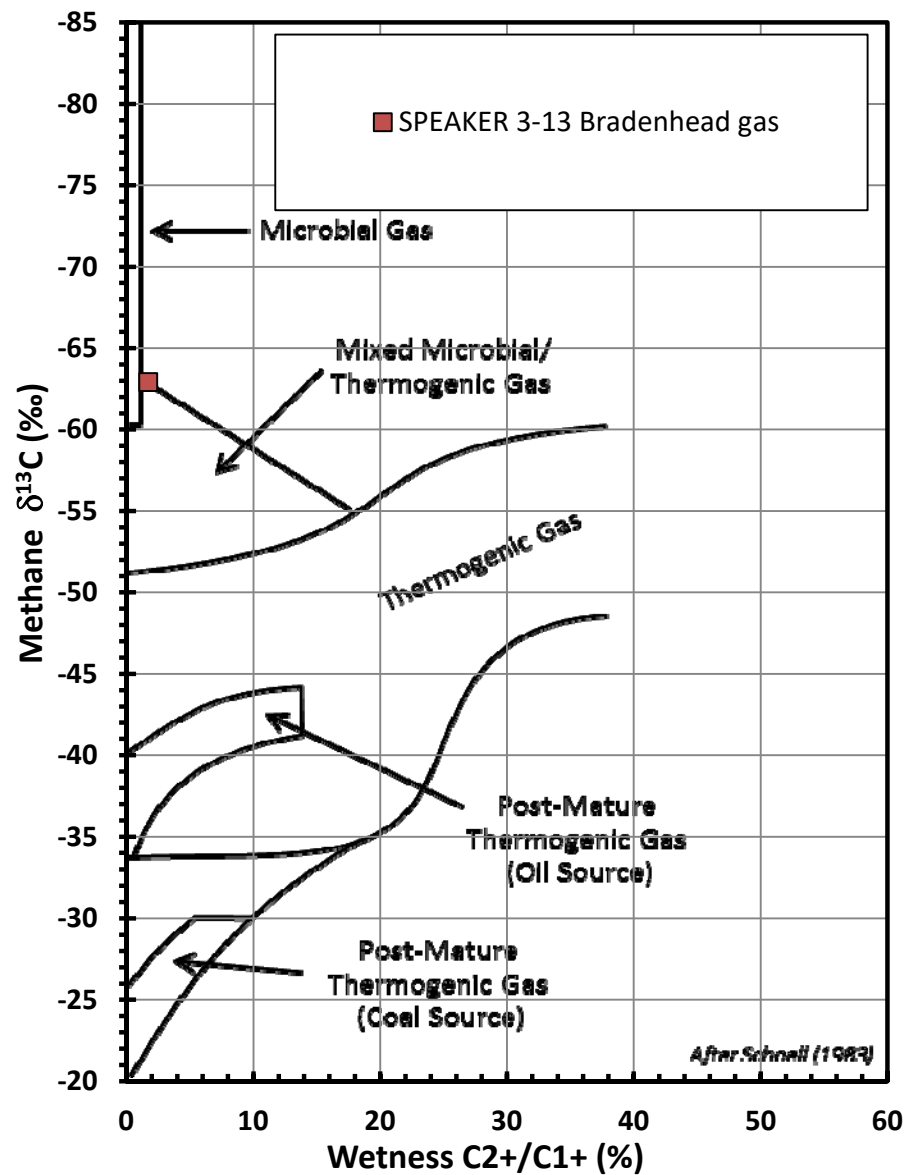
SPECIFIC GRAVITY*	
Total Gas	HC only
Spec Grav	Spec Grav
0.580	0.567

Stable isotope results based on multi-point laboratory calibration
Values in red represent low signal; interpret with caution
Precision δ13C < 0.5 ‰
Precision δD < 5 ‰
* At ideal gas, with gas concentrations normalized to 100%;
calculations based on GPA 2145-09 physical constants.

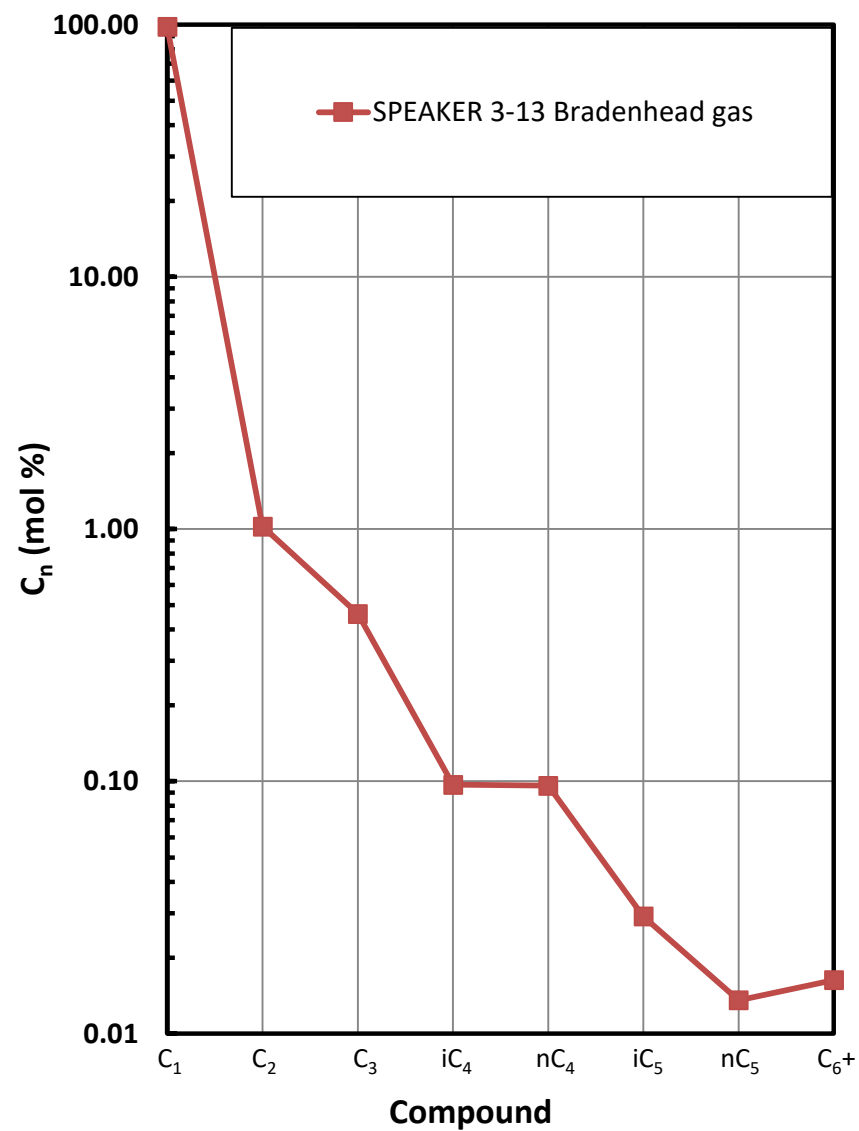
SPECIFIC GRAVITY*	
Total Gas	HCs only
Spec Grav	Spec Grav
0.580	0.567

INTERPRETIVE PLOTS

Methane $\delta^{13}\text{C}$ vs Wetness Genetic Classification Plot

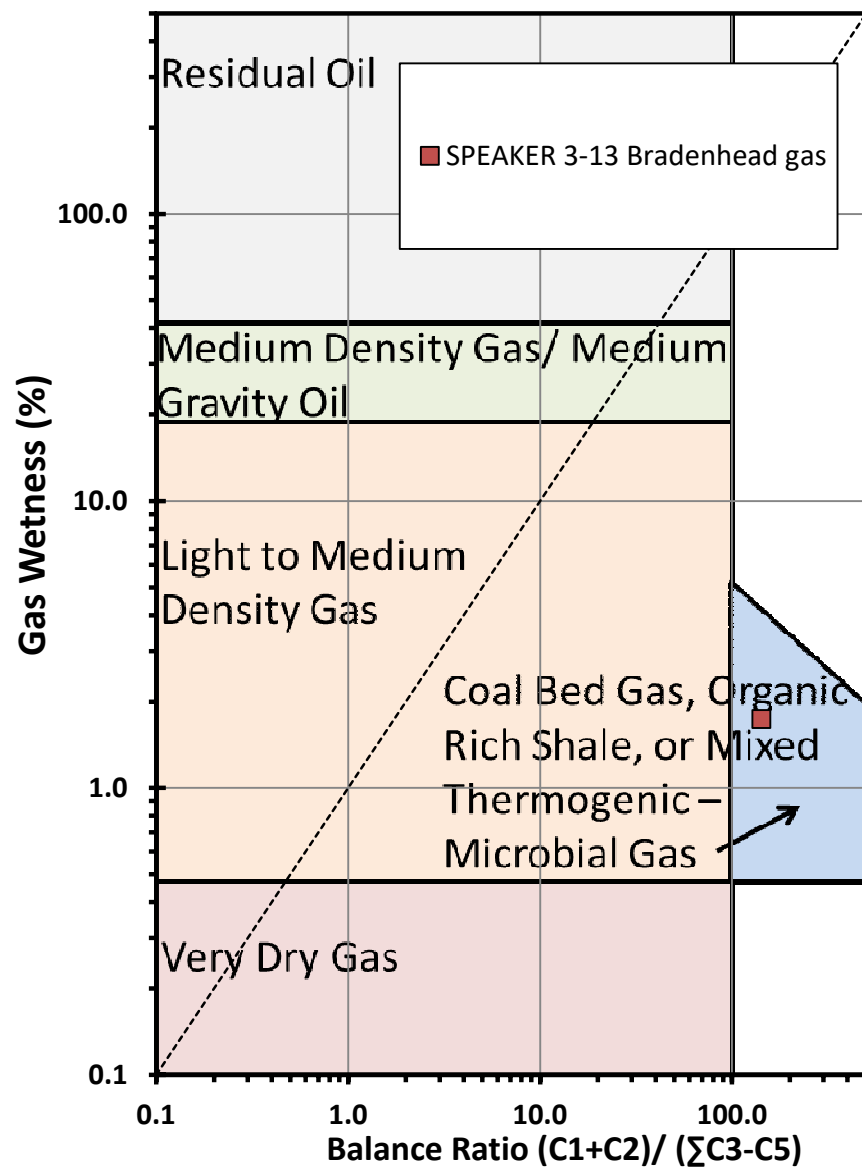


Hydrocarbon Composition Plot

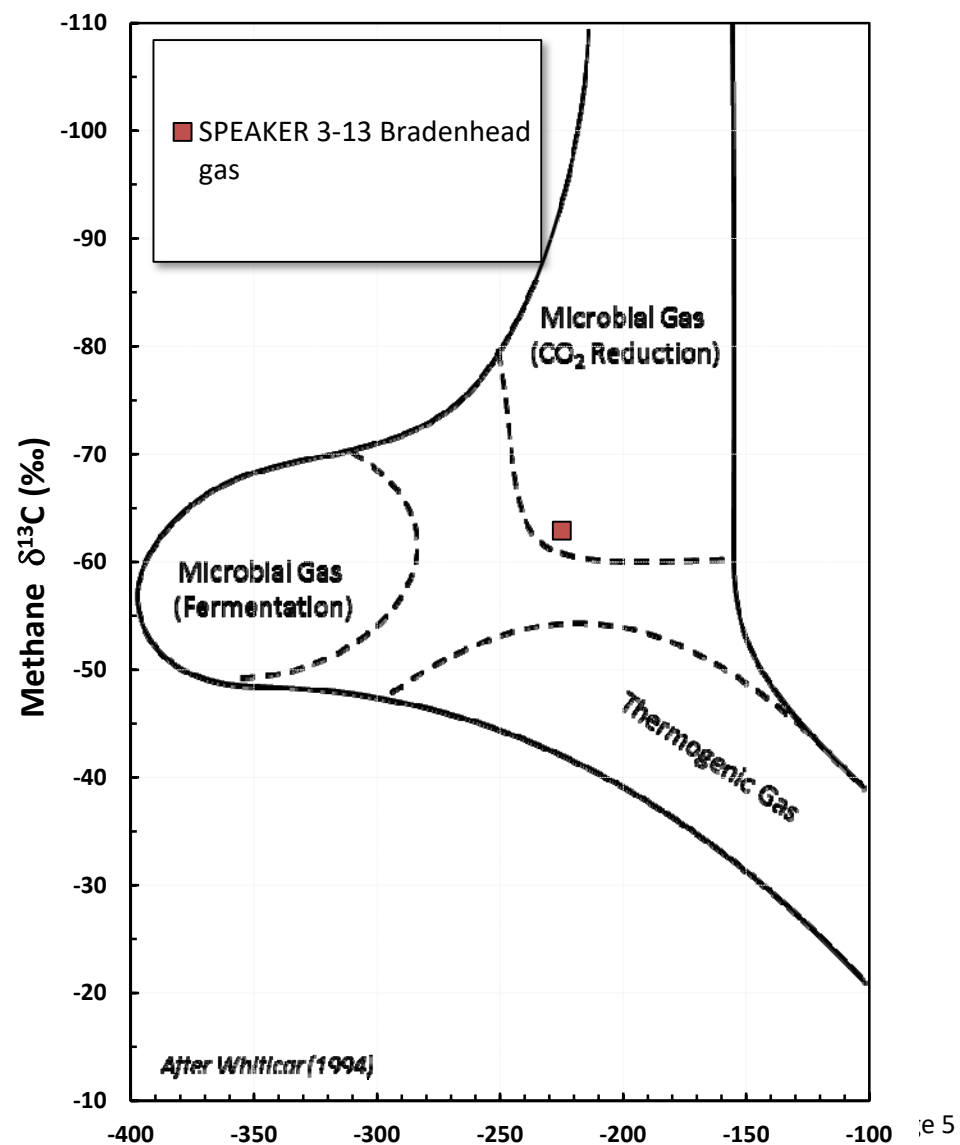


INTERPRETIVE PLOTS

Haworth Ratio Plot - Characterization of Hydrocarbon Type



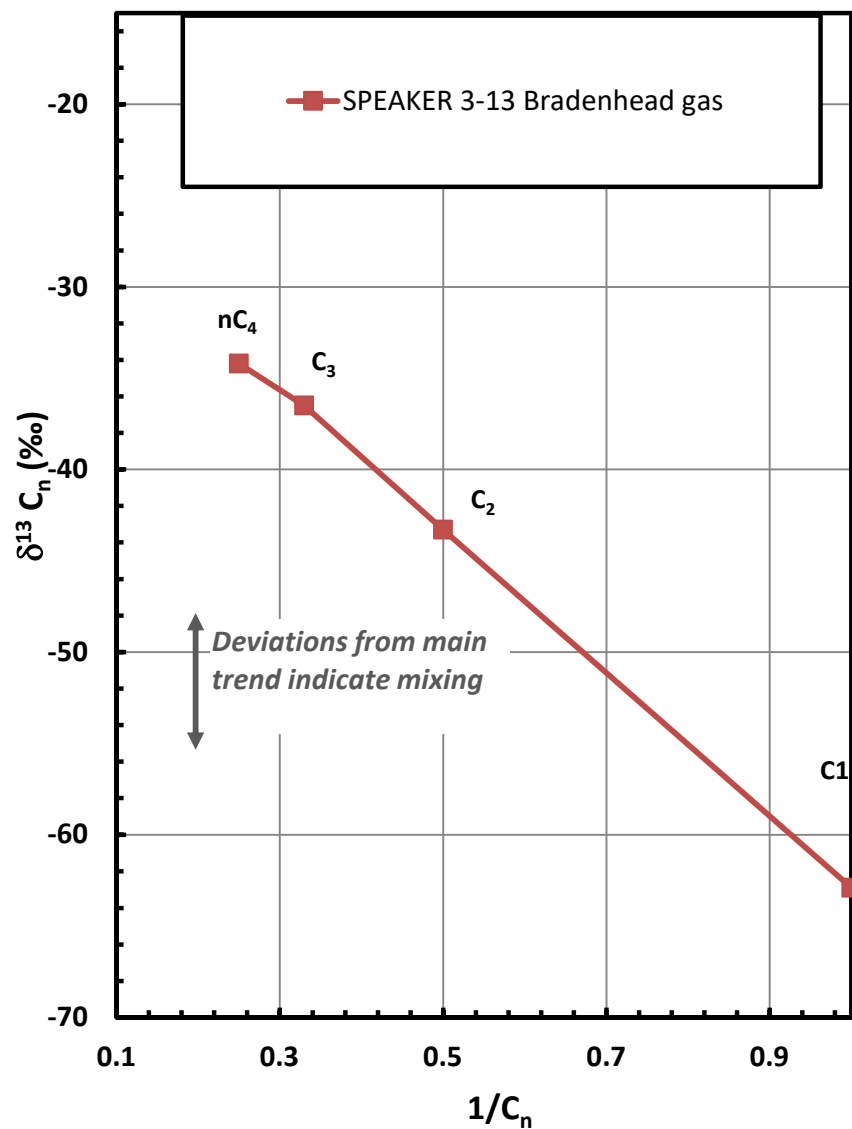
Methane $\delta^{13}C$ vs δD Genetic Classification Plot



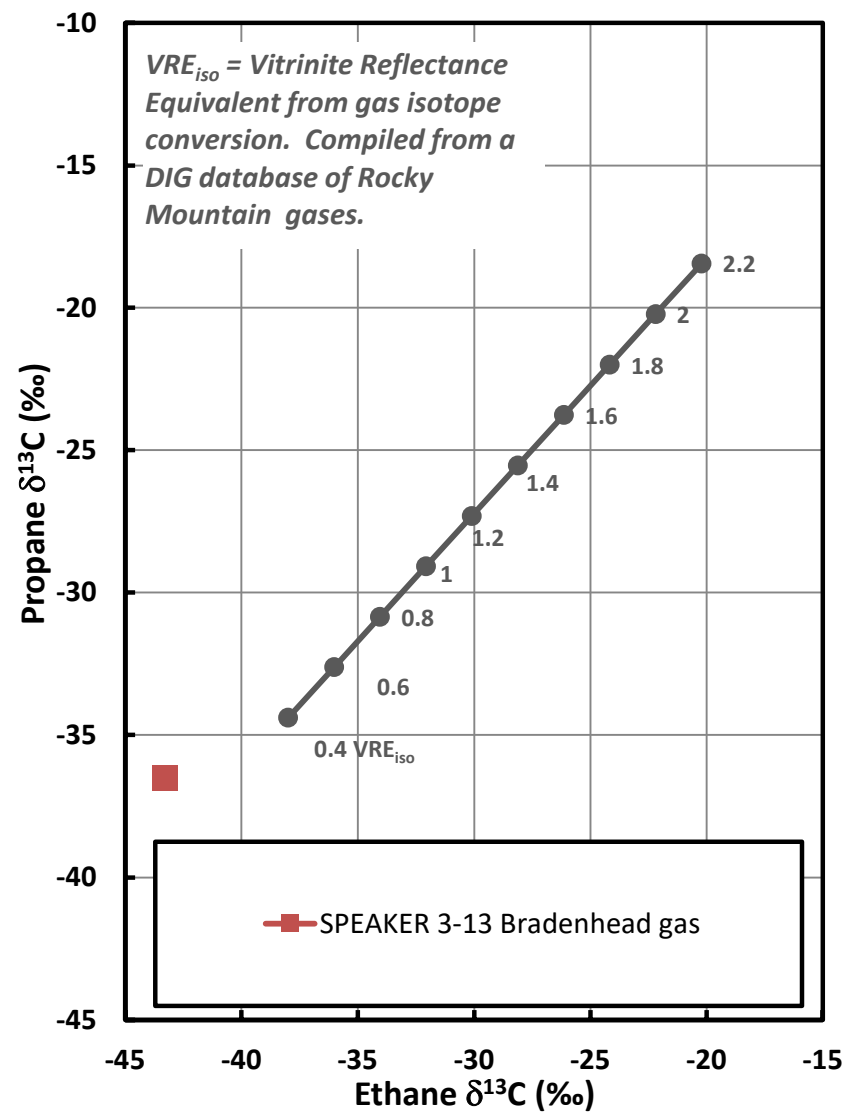
Methane δD (‰)

INTERPRETIVE PLOTS

Mixing Plot

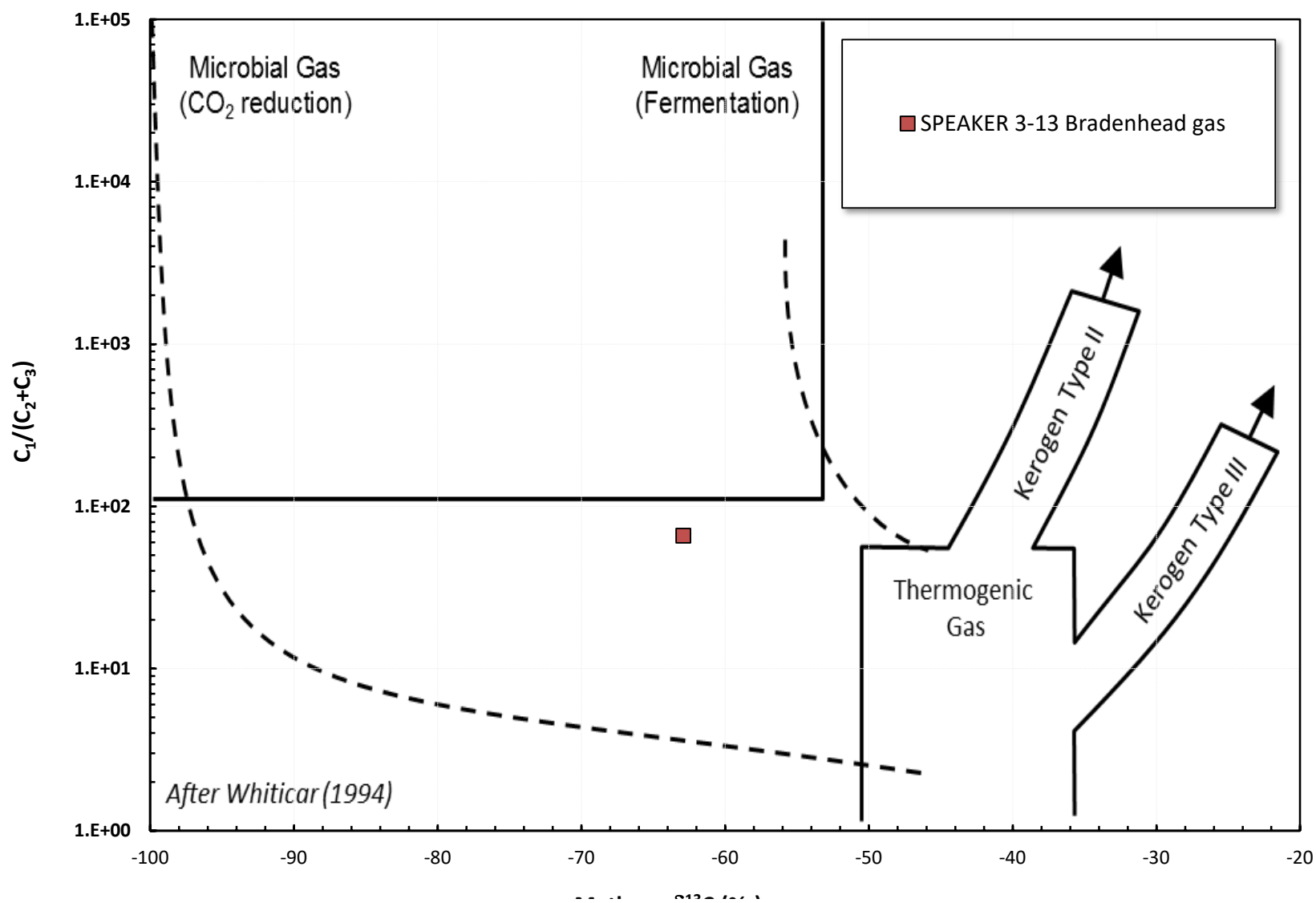


Ethane - Propane Maturity Plot



INTERPRETIVE PLOTS

Methane $\delta^{13}\text{C}$ vs $\text{C}_1/(\text{C}_2+\text{C}_3)$ Genetic Classification Plot



Methane $\delta^{13}\text{C}$ (‰)