“Log Petrophysics of the Lower Permian Chase Group in the Hugoton Gas Field of southwestern Kansas”

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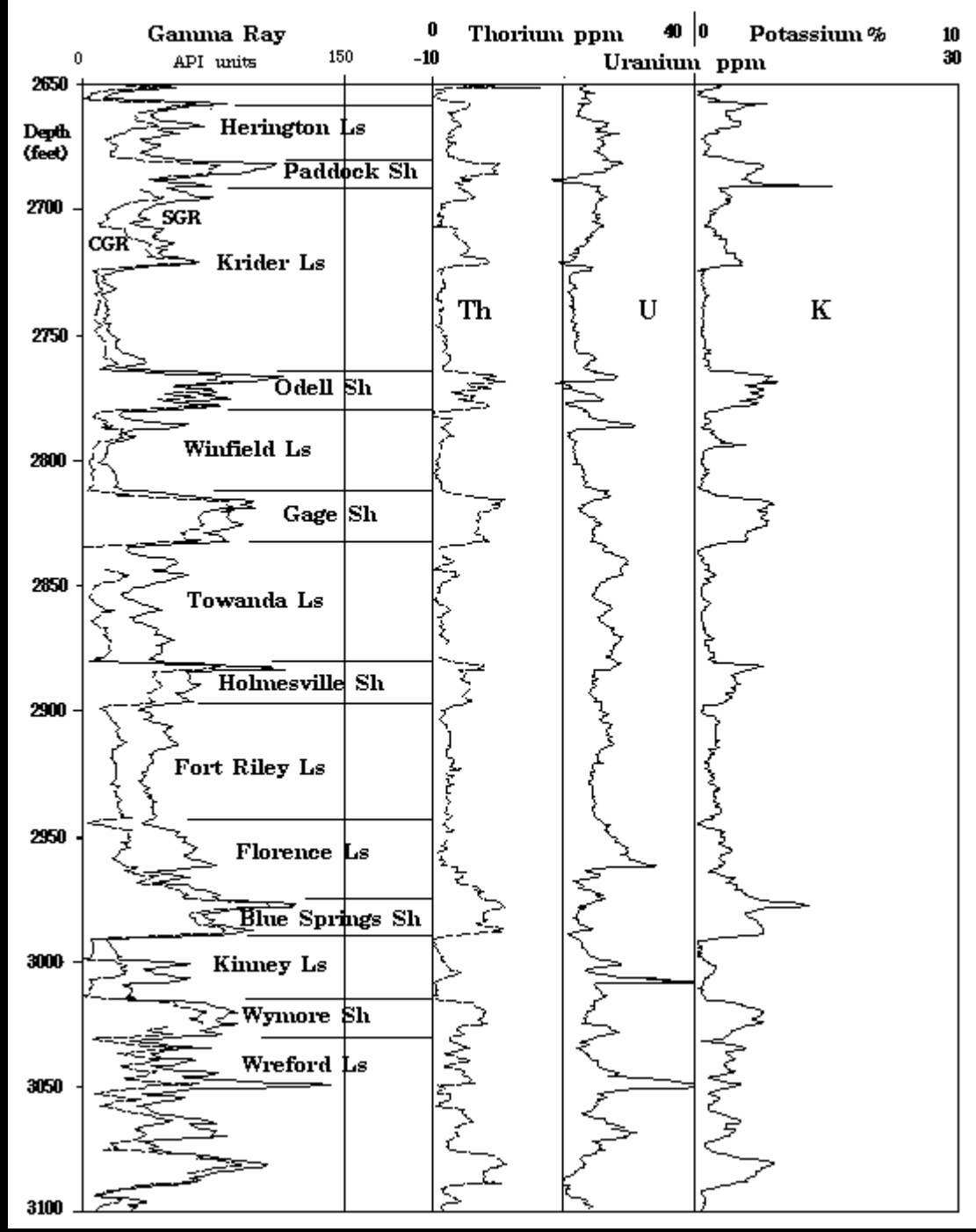
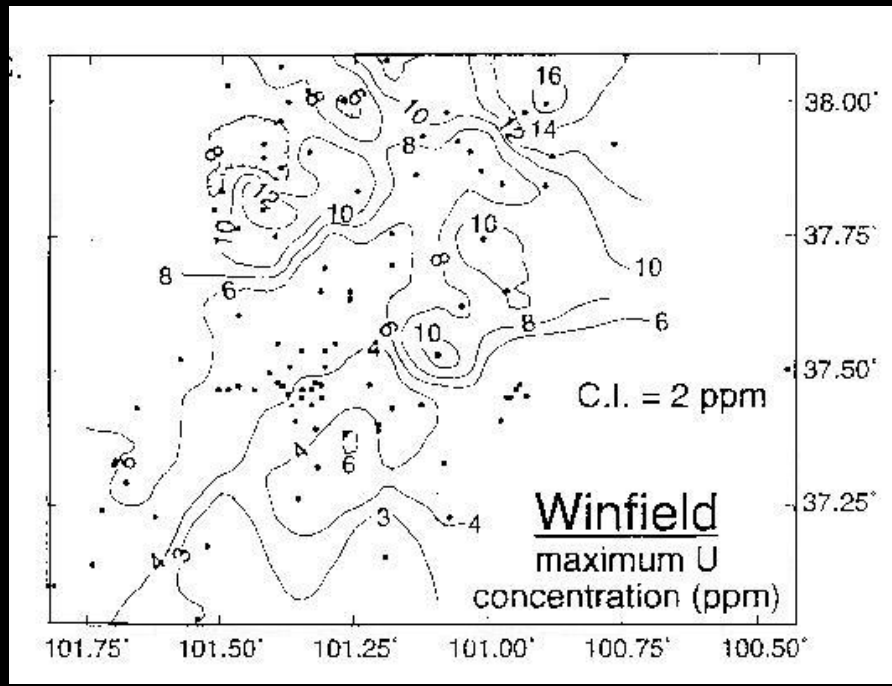
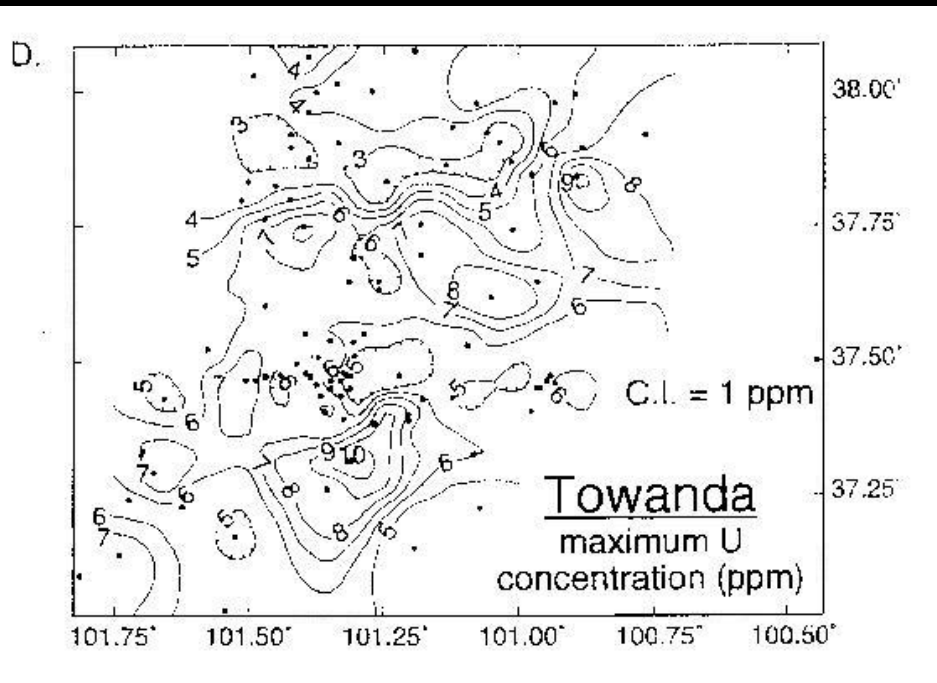
Kansas Geological Survey

Spectral Gamma-ray log of a Chase Group section



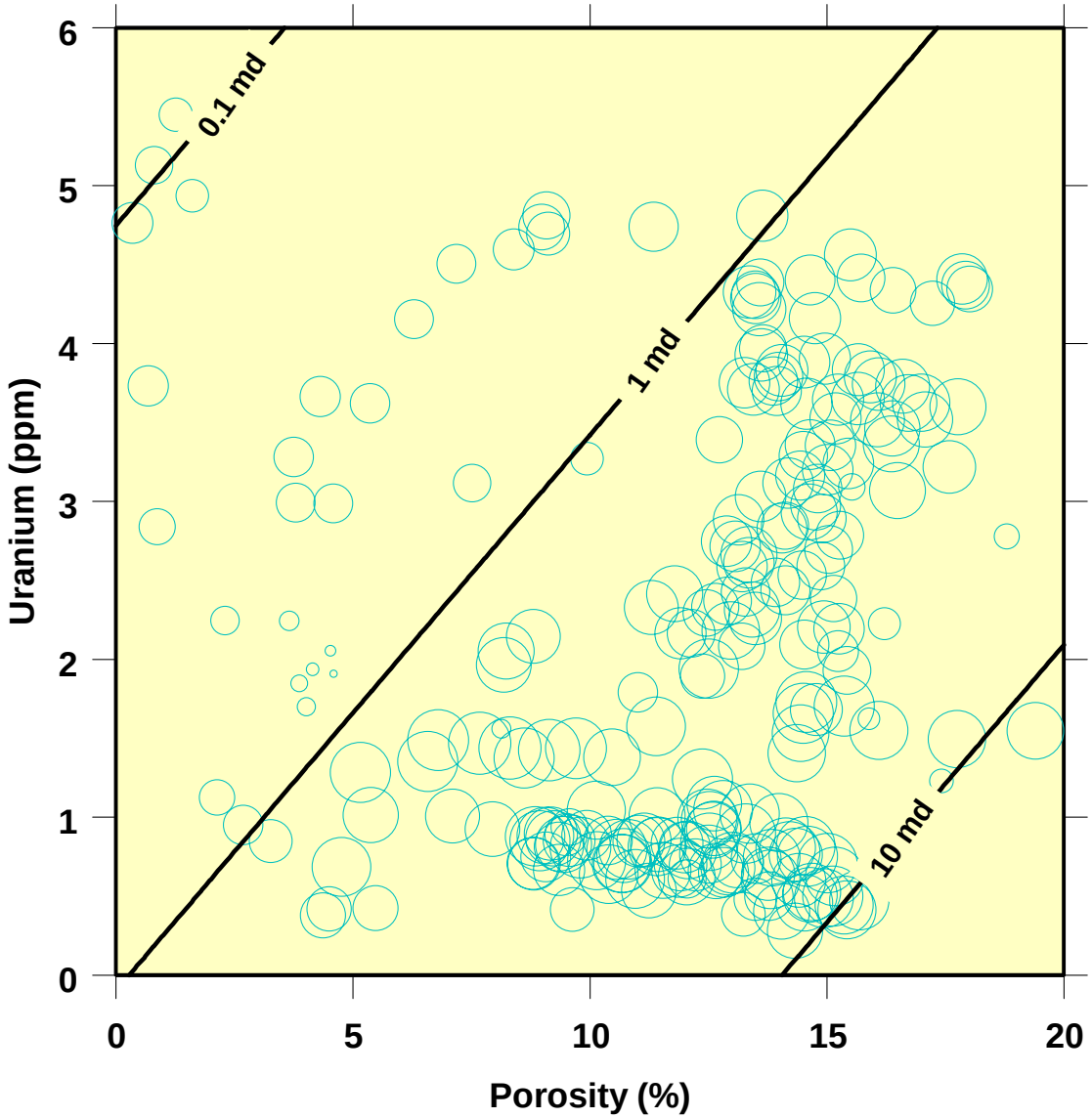
Examples of spatial variation of uranium in Chase Group units



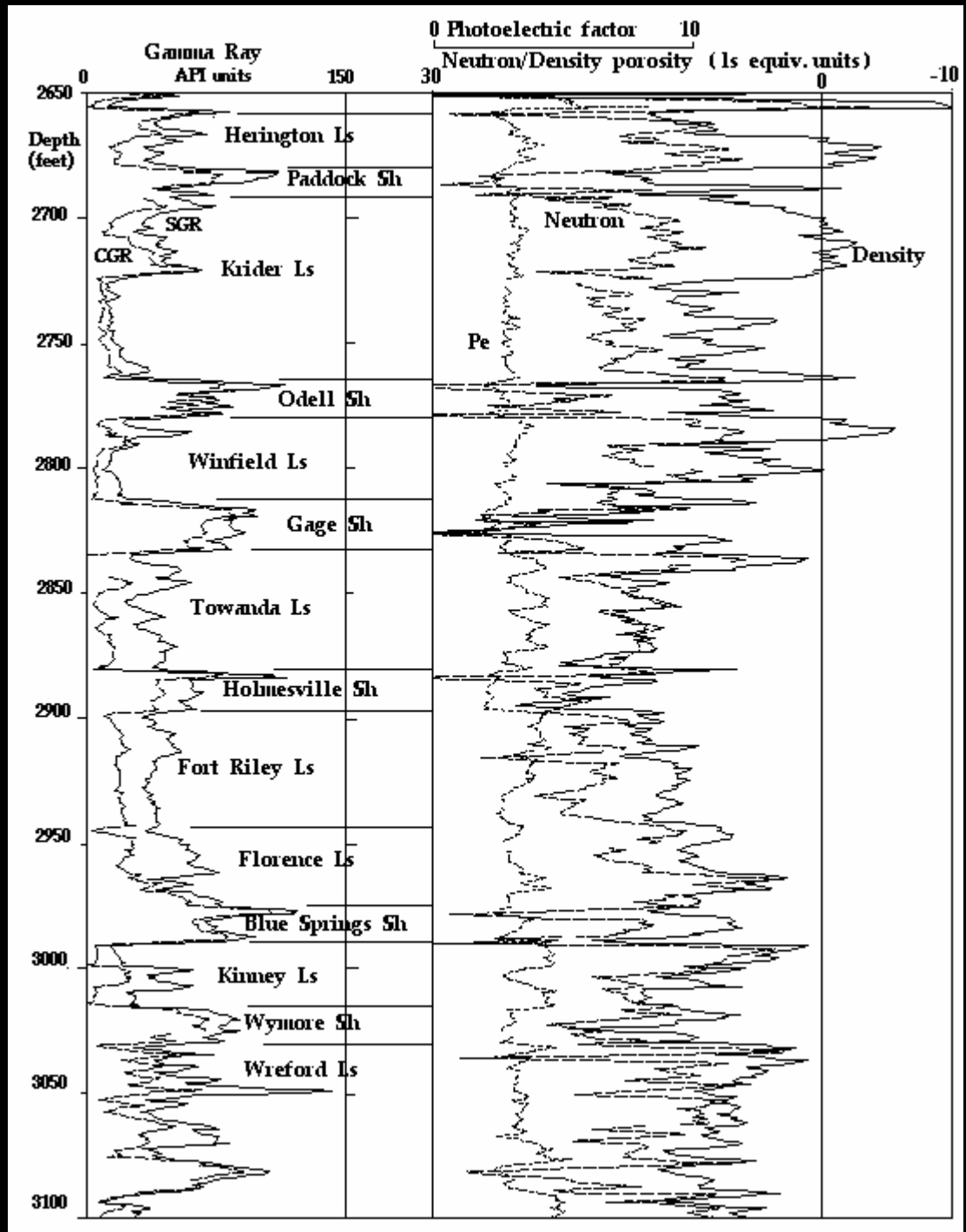


From Luczaj (1998)

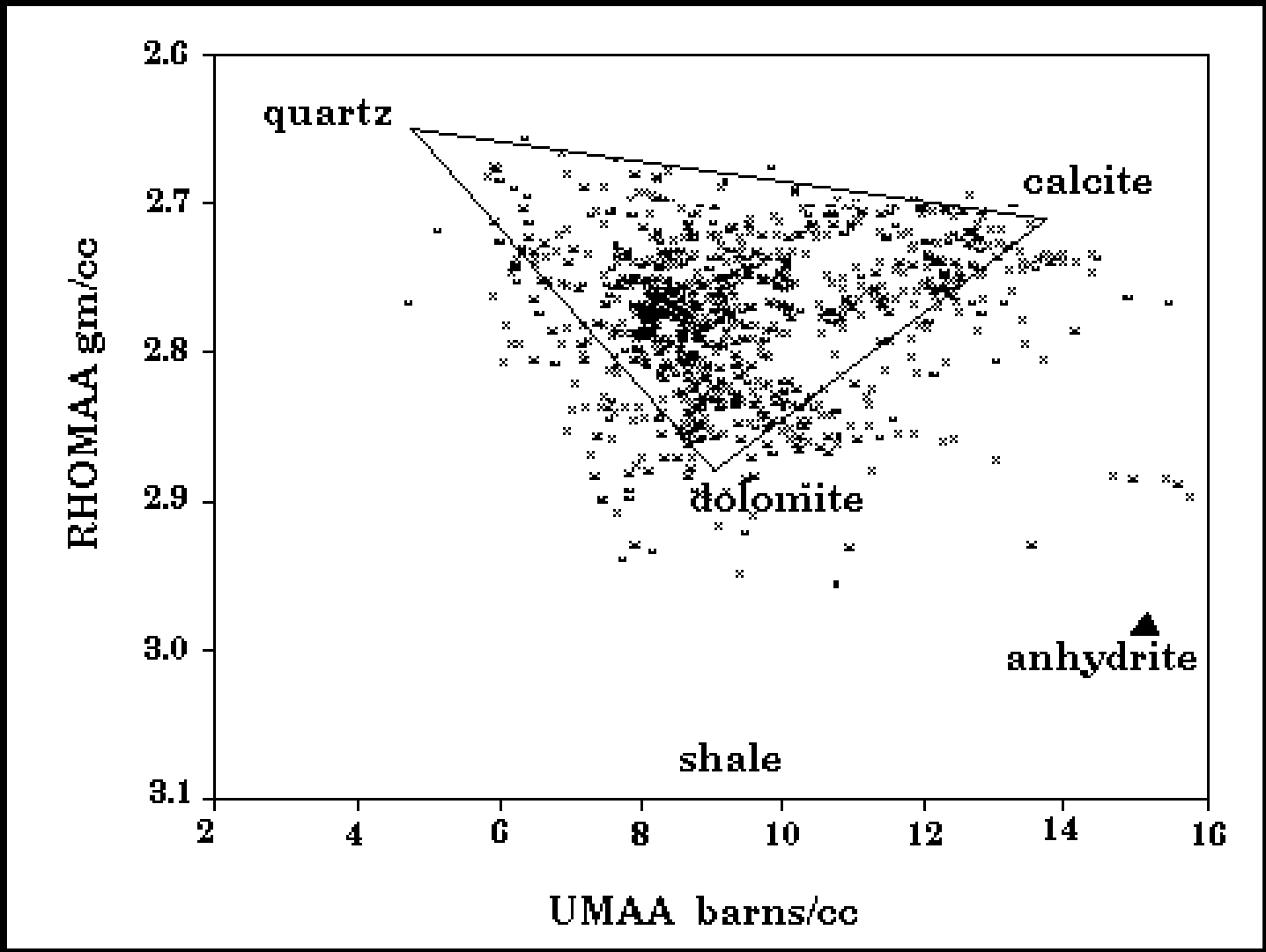
Permeability versus porosity and uranium



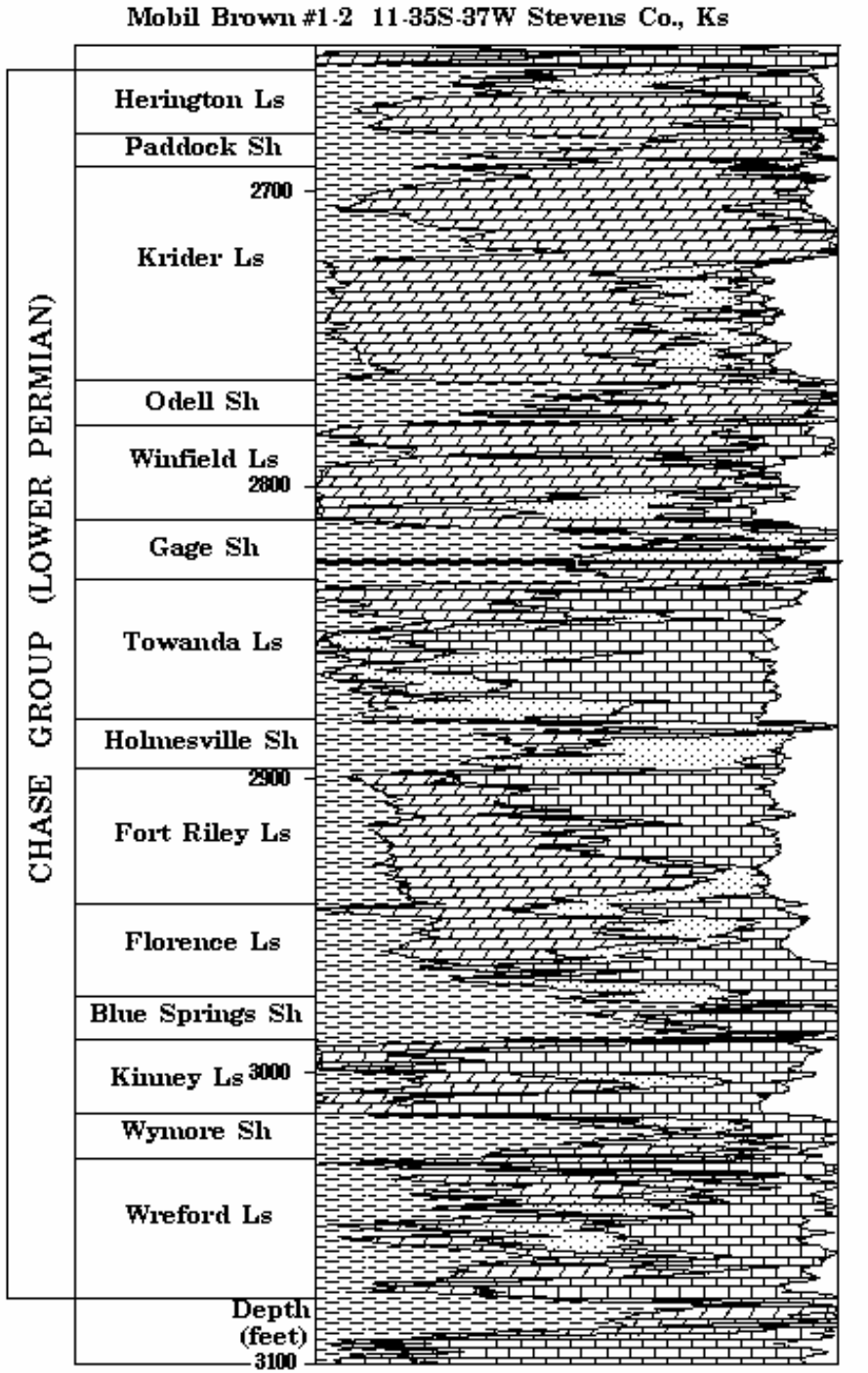
Lithodensity neutron logs of a Chase Group section



Chase Group RHOmaa – Umaa crossplot



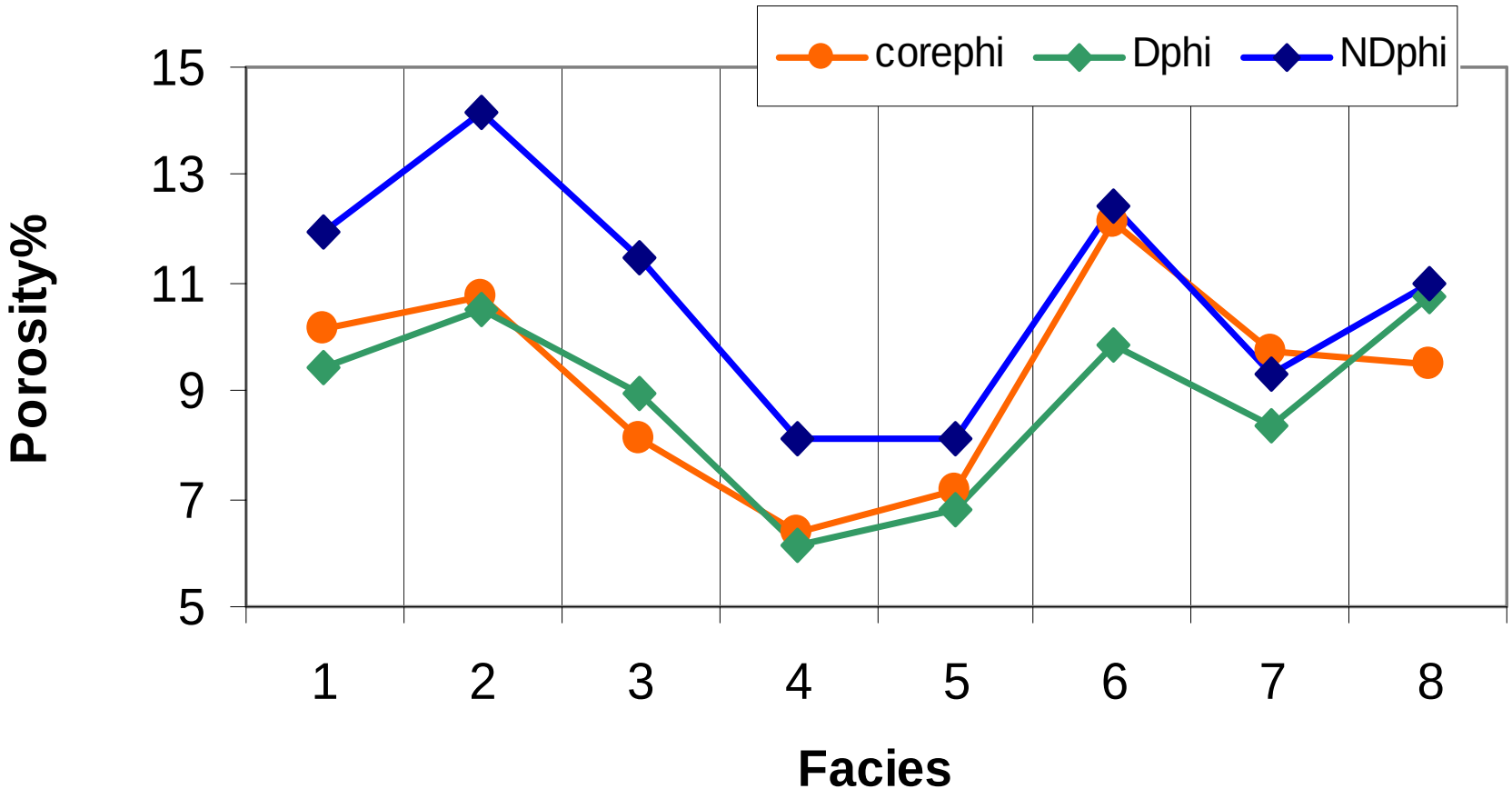
Compositional profile computed from gamma-ray, density, neutron porosity, and photoelectric factor logs



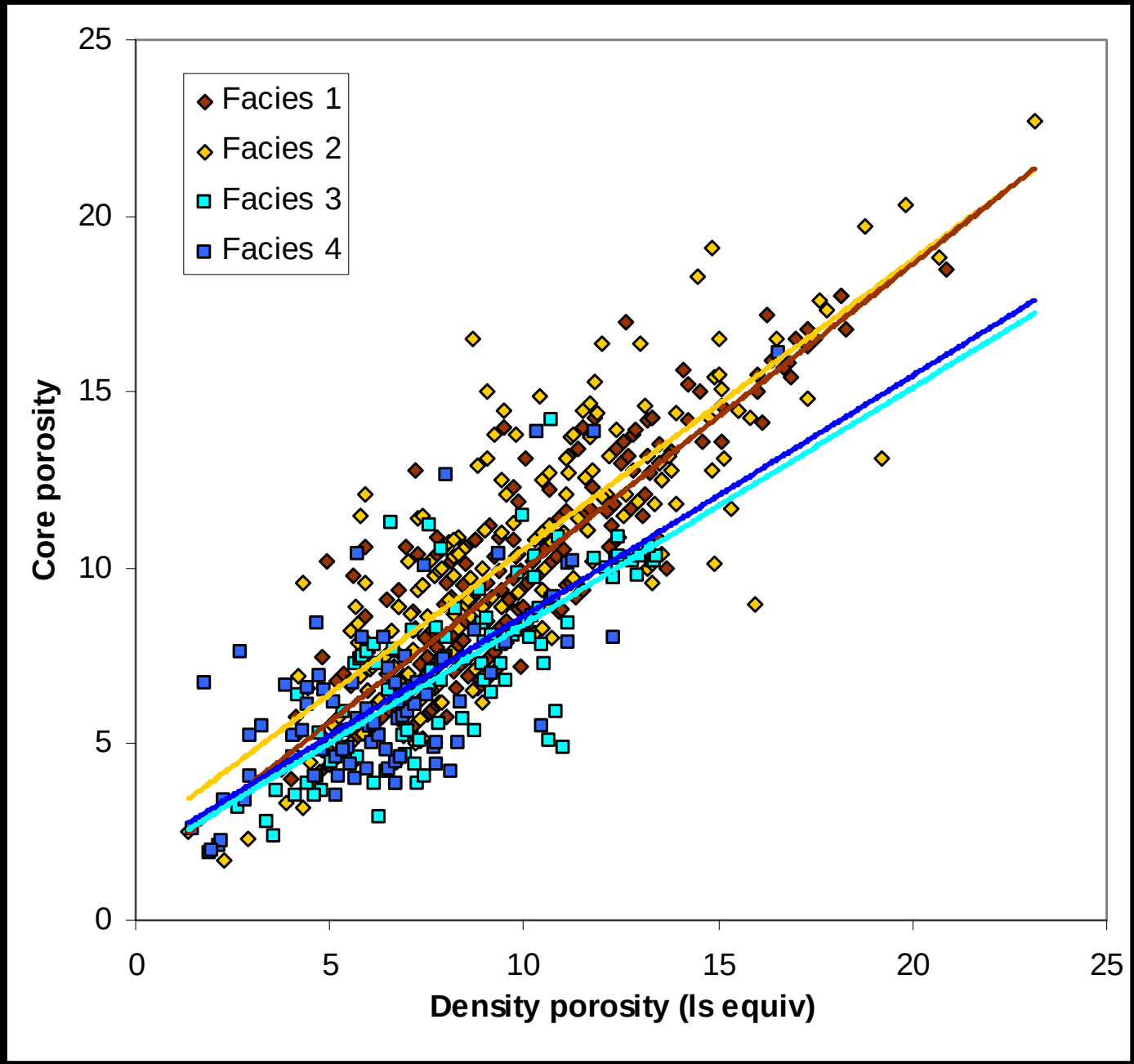
Council Grove core porosity calibration data set

facies		plugs	whole core	total	outliers	final
1	NM Silt & Sand	156	106	262	9	253
2	NM ShlySilt	167	31	198	2	196
3	Mar Shale & Silt	70	33	103	0	103
4	Mdst/Mdst-Wkst	67	22	89	0	89
5	Wkst/Wkst-Pkst	147	59	206	2	204
6	Sucrosic (Dol)	35	19	54	1	53
7	Pkst/Pkst-Grnst	116	64	180	11	169
8	Grnst/PA Baff	34	28	62	2	60
		792	**362**	**1154**	**27**	**1127**

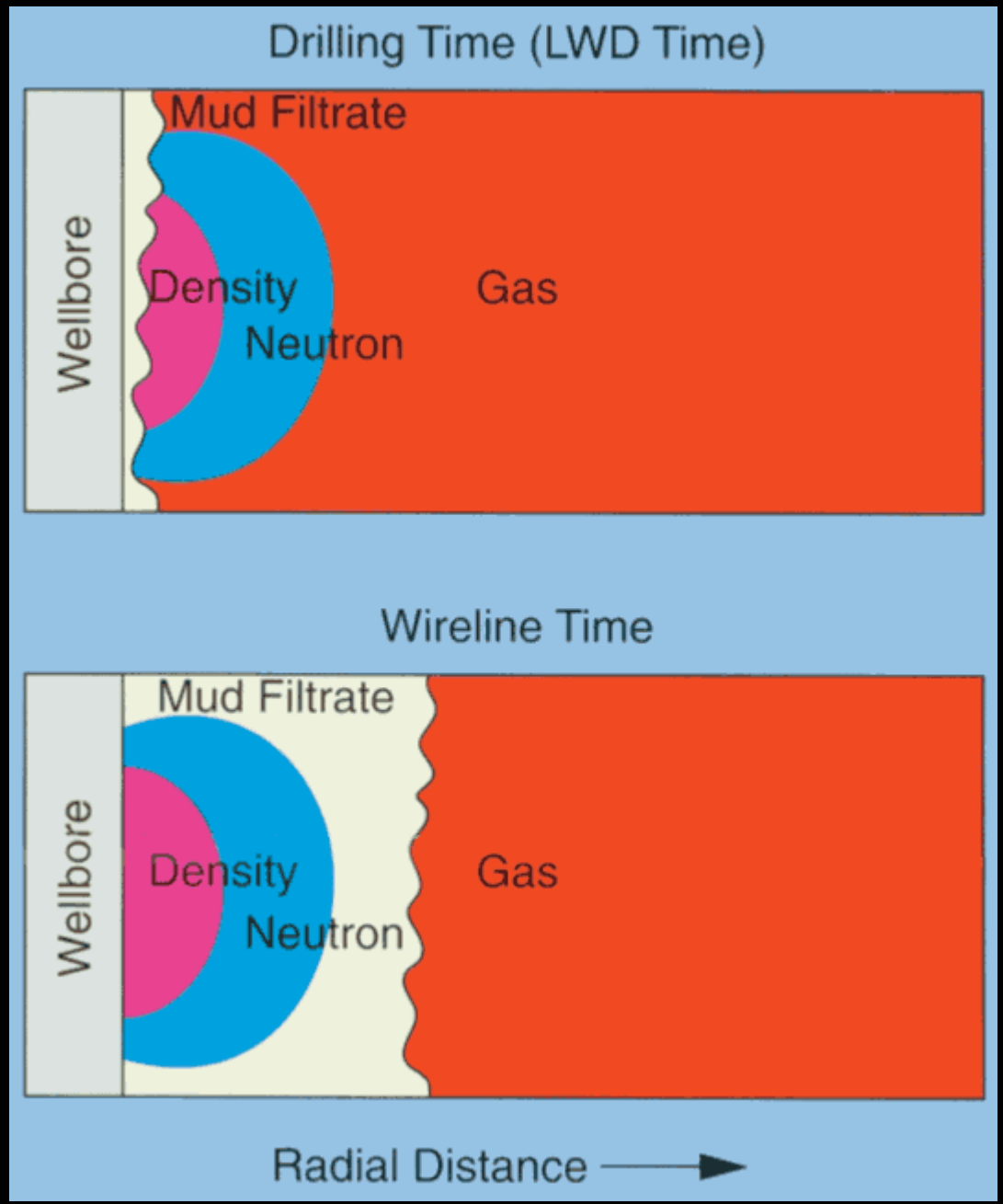
Log/Core porosity comparison



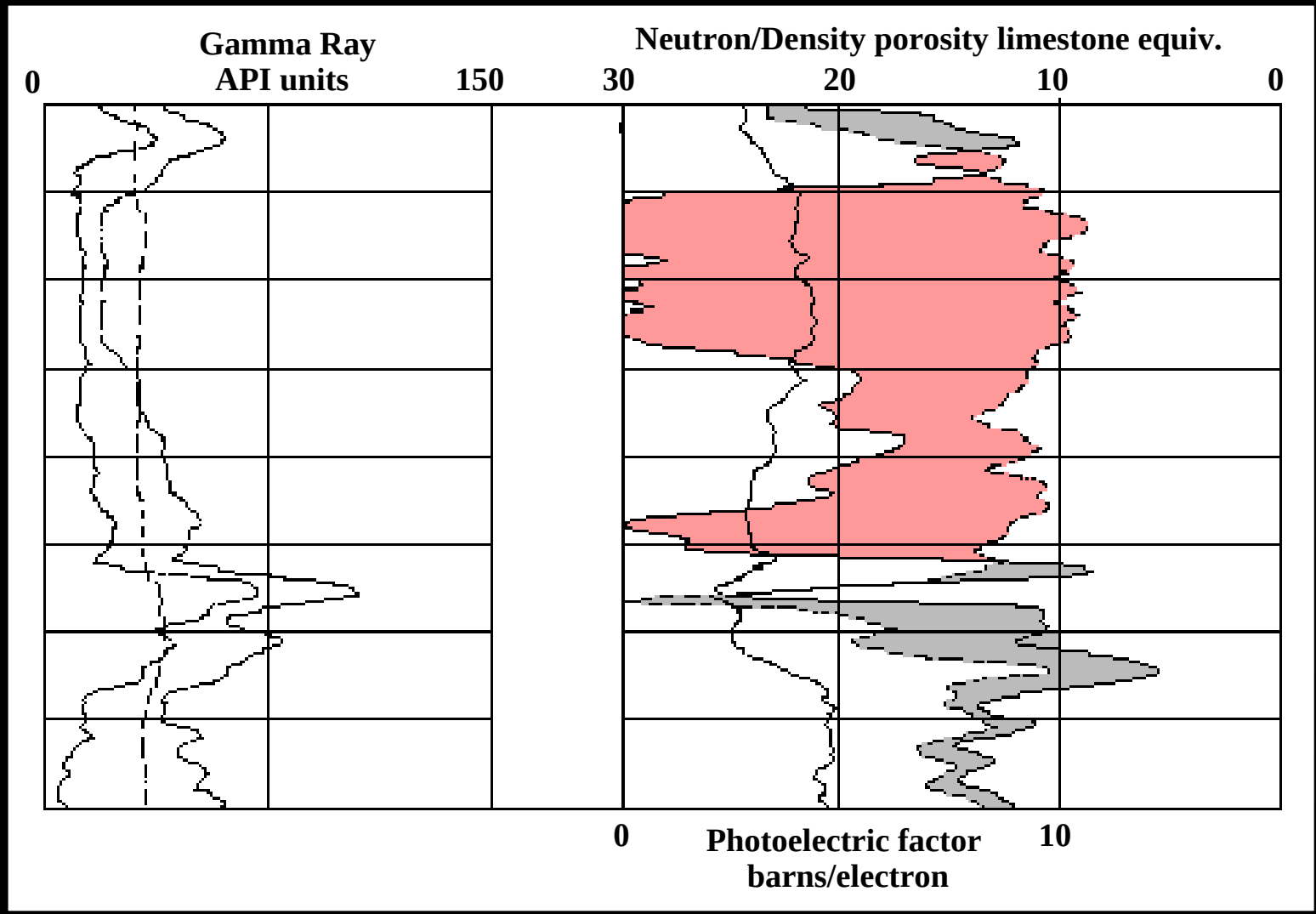
Non-marine (facies 1 & 2) and marine (facies 3 and 4) siltstones



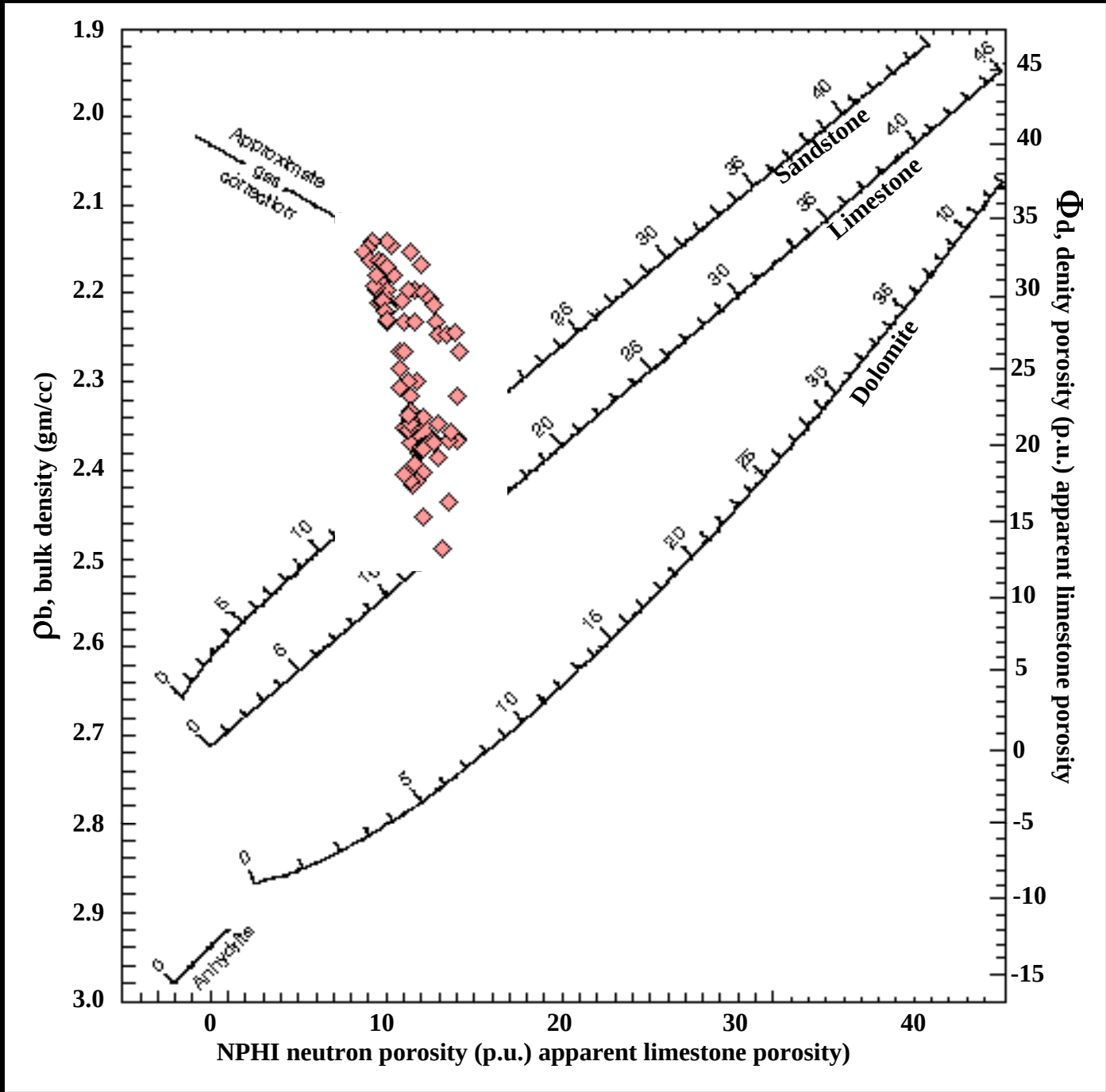
Gas effects: Invasion and depth of investigation of density and neutron tools



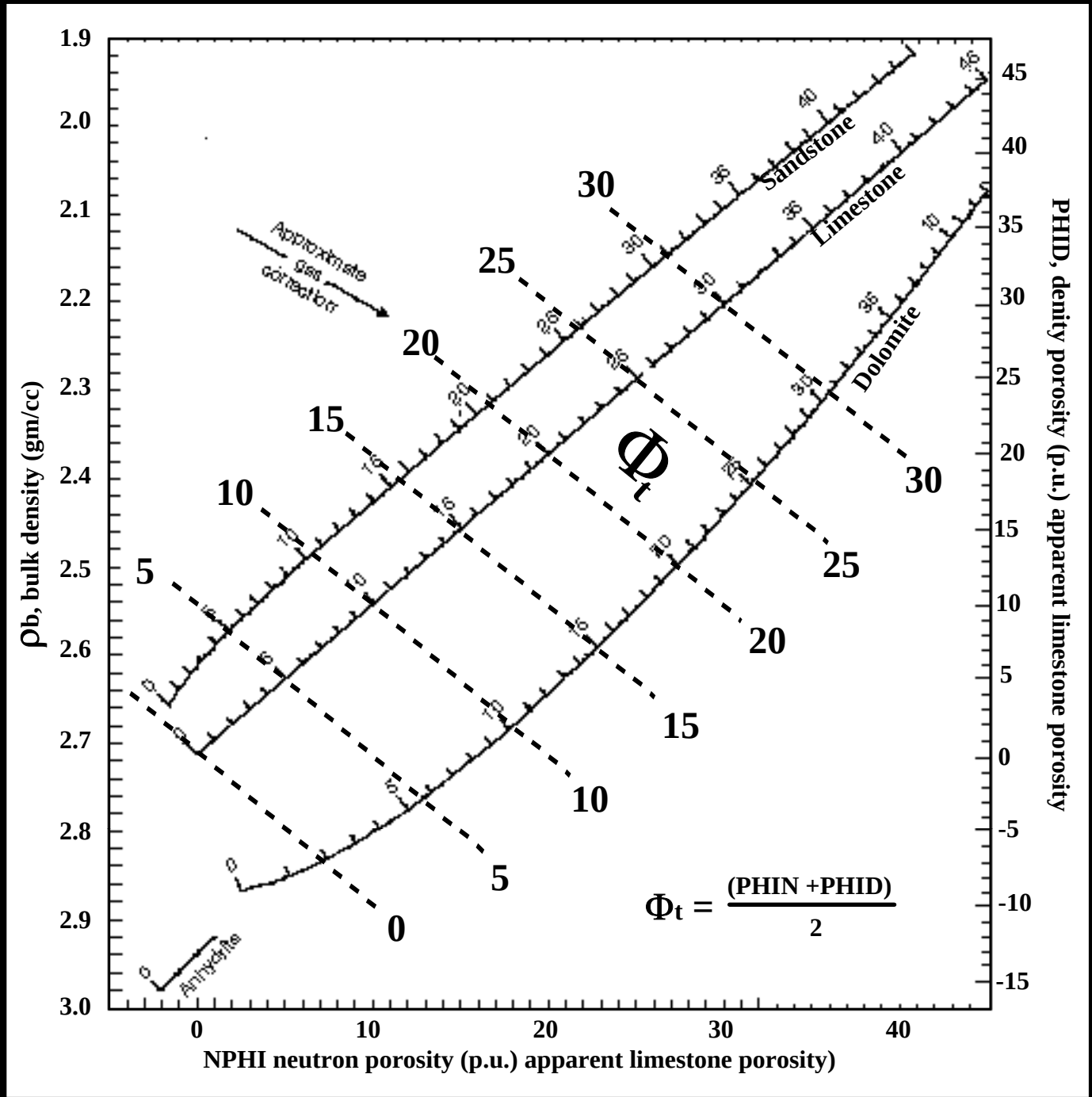
Example of gas effect in the Towanda Limestone



Towanda Limestone gas effect on neutron – density crossplot



Relationship between Xplot porosity, averaged neutron-density porosity, and gas effect



Common porosity estimations with gas correction:

(1) Approximation of the Gaymard-Poupon equation

$$\Phi = \sqrt{\frac{(\Phi n^2 + \Phi d^2)}{2}}$$

(2) Empirical

$$\Phi = 0.33 * \Phi n + 0.67 * \Phi d$$

Chase Group/ Council Grove
statistical analysis of neutron density porosities calibrated to core porosity (accommodating gas effect)

Limestones (n = 786):

$$\Phi = 0.399 * \Phi\mathbf{n} + 0.610 * \Phi\mathbf{d}$$

Dolomites (n = 513):

$$\Phi = 4.63 + 0.259 * \Phi\mathbf{n} + 0.523 * \Phi\mathbf{d}$$

Acknowledgements

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OXY USA, Inc.
Pioneer Natural Resources USA, Inc.