

Effect of Physical Properties on Wave Velocity in Core Samples

Thanyanat Akarapatima¹, Manika Prasad² ¹Department of Geophysics, Colorado School of Mines, ²Department of Petroleum Engineering, Colorado School of Mines



Introduction

Shaly sandstones and shales present as a major lithology of sedimentary basins and relevance to hydrocarbon reservoirs. Reservoir performance depends directly to physical properties, which can be implied from velocity. However, often of time, velocity measurement is unreliable (well damage), not properly collected or incomplete. Therefore, velocity prediction from other rock properties can be very useful. So, the acoustic properties of the lithology are important in seismic and well log interpretation. The project is done by gathering physical properties measured in a laboratory and literatures, analyze their relationship with velocity by cross plotting and performing statistical analysis with Matlab.

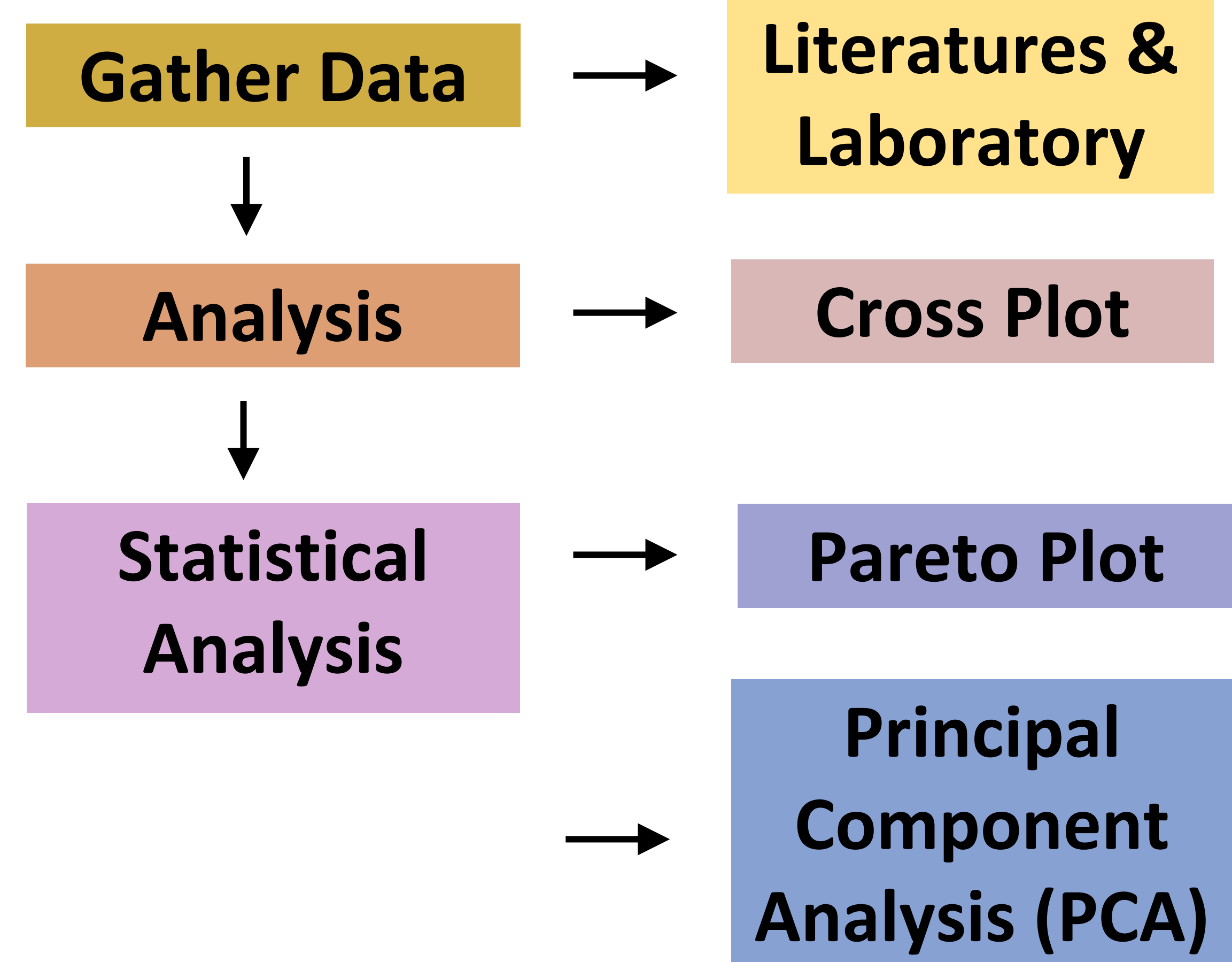
Physical Properties

- Ultrasonic velocity : V_p, V_s
- Stiffness tensor : $C_{11}, C_{33}, C_{44}, C_{66}$
- Clay content
- Porosity
- Bulk density
- Thomsen's parameters: Epsilon, Gamma, Delta
- Stress, strain
- Organic content : Kerogen, HI, OI, S_1, S_2, S_3
- BET surface area

Lithology

- Bakken
- Bazhenov
- Japan
- Lockatong
- Monterey
- Niobrara
- Northsea
- Woodford

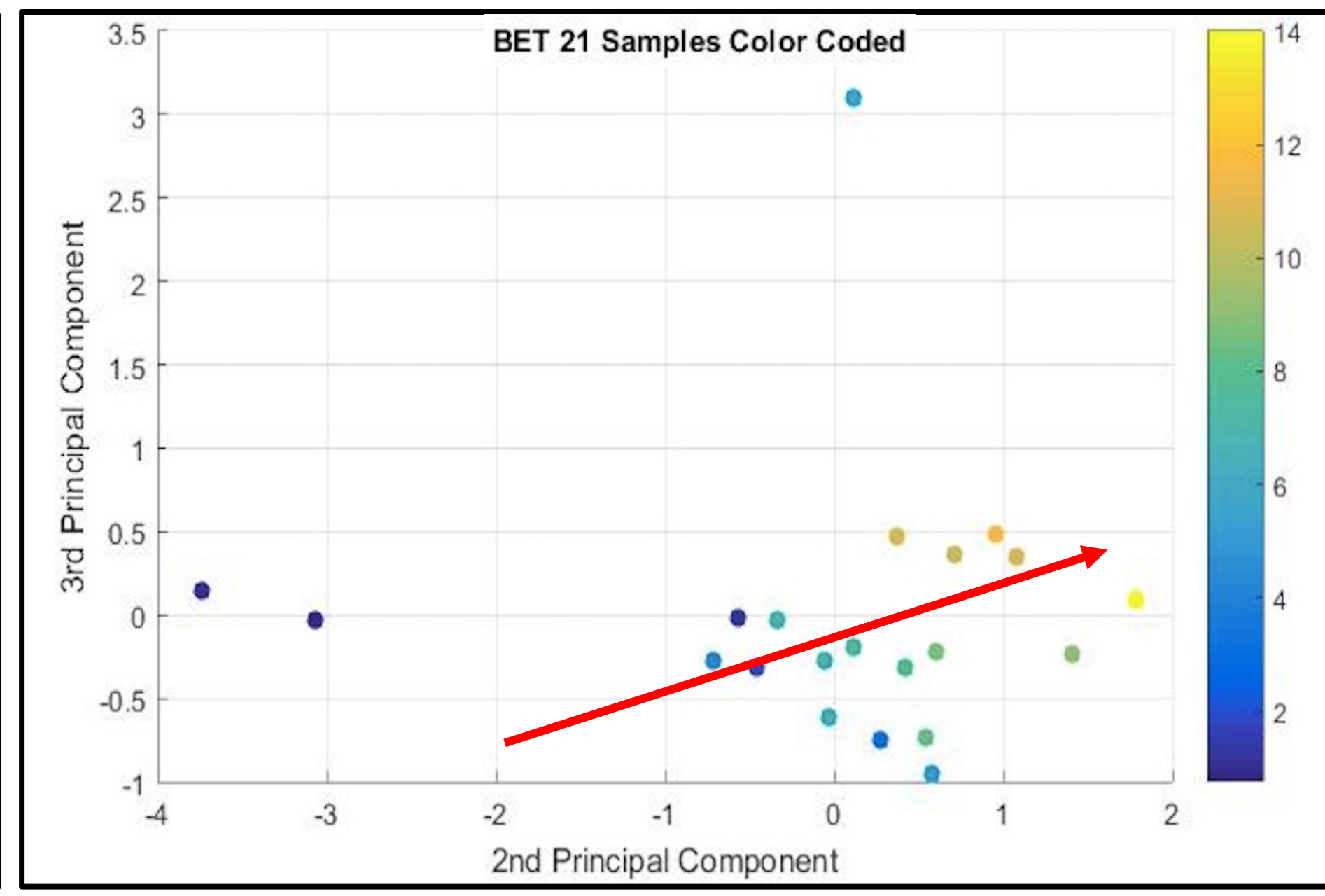
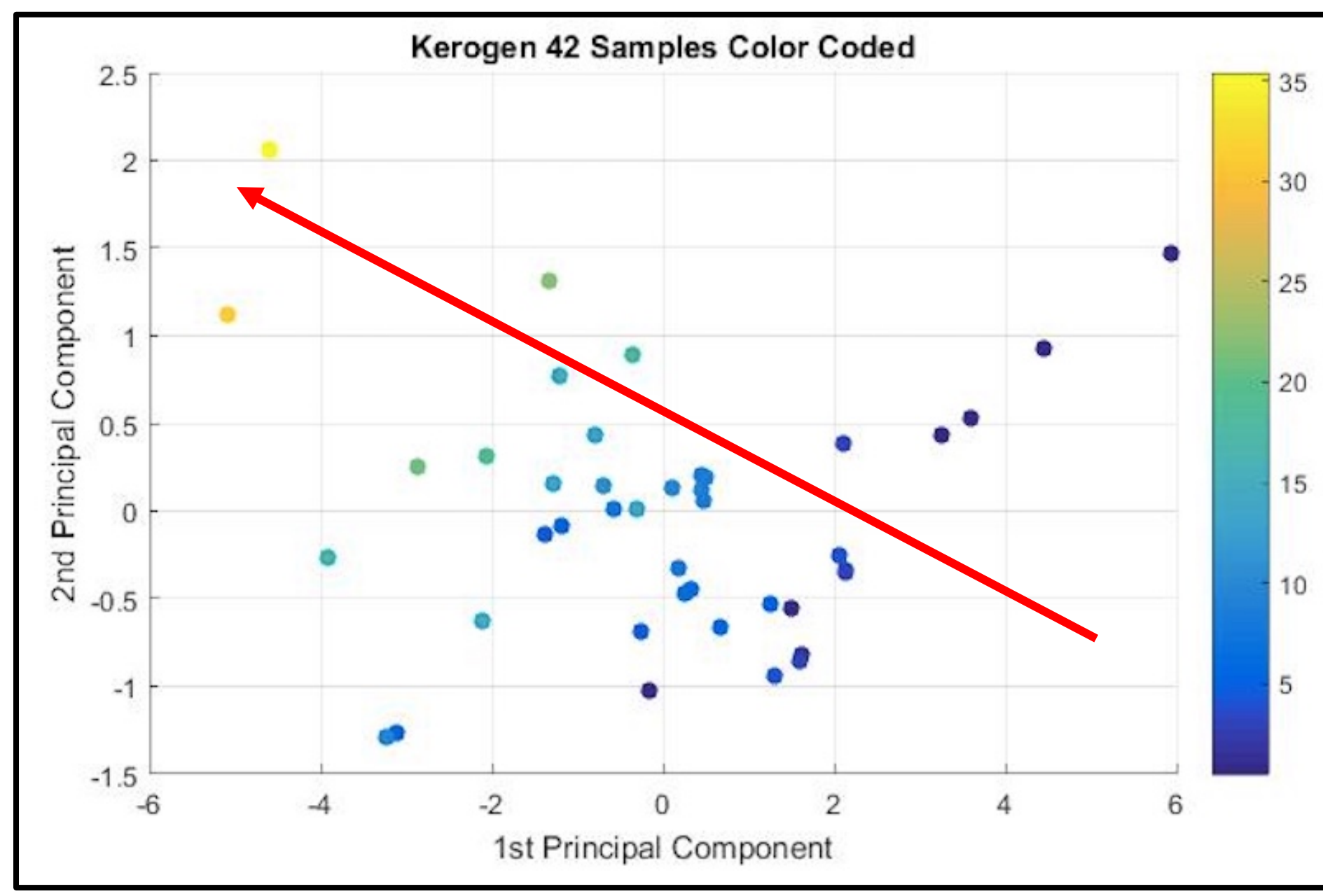
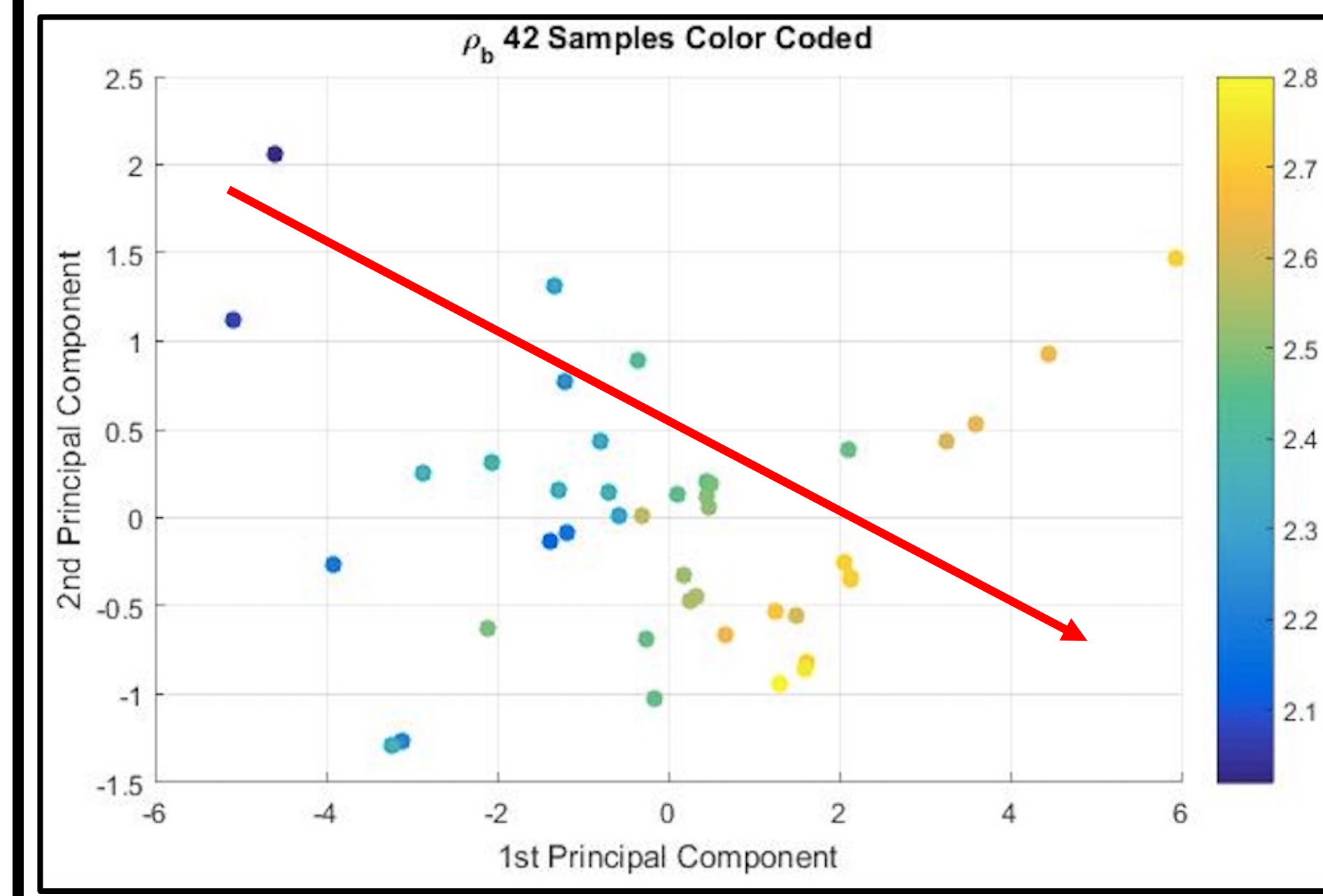
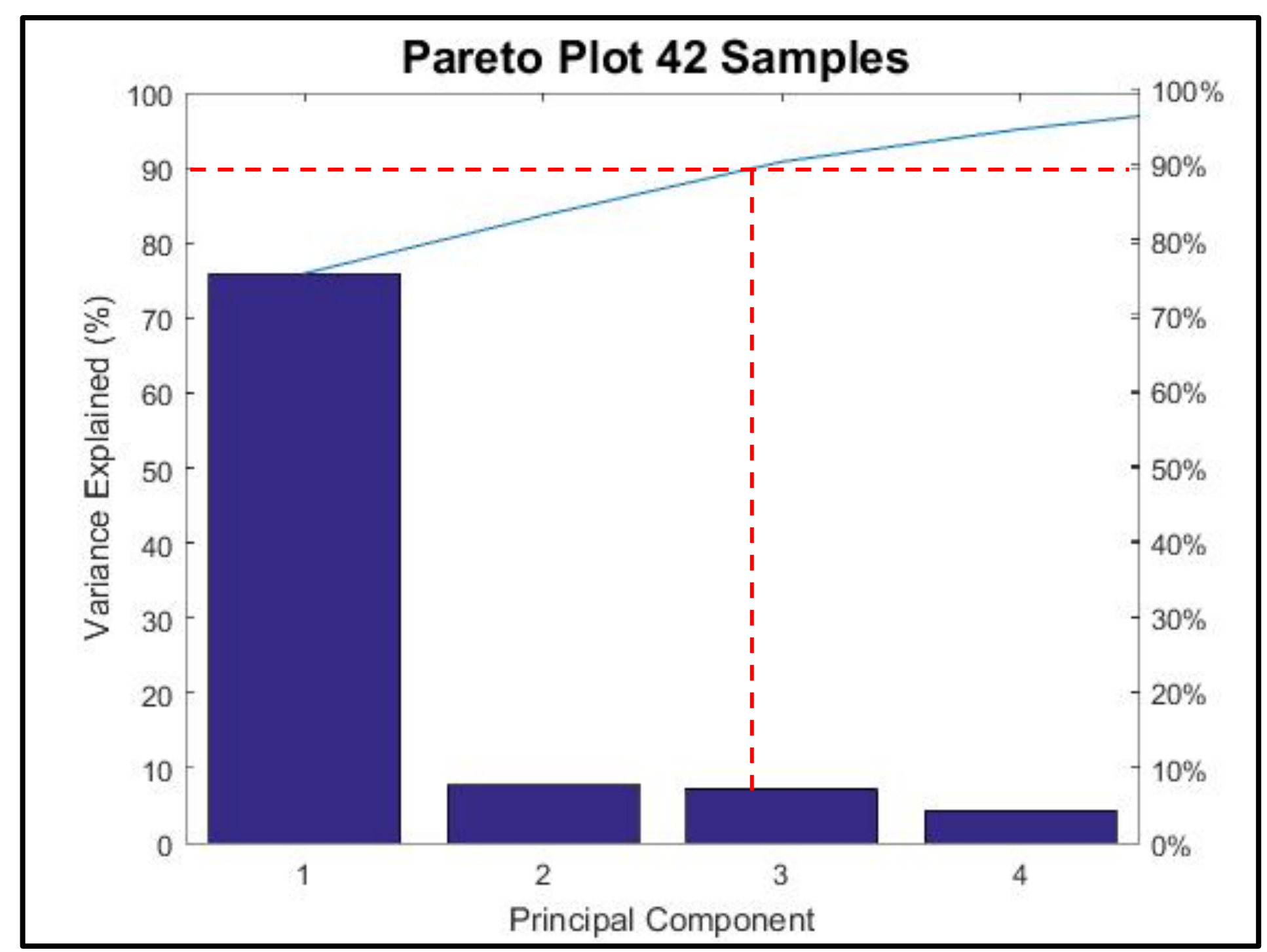
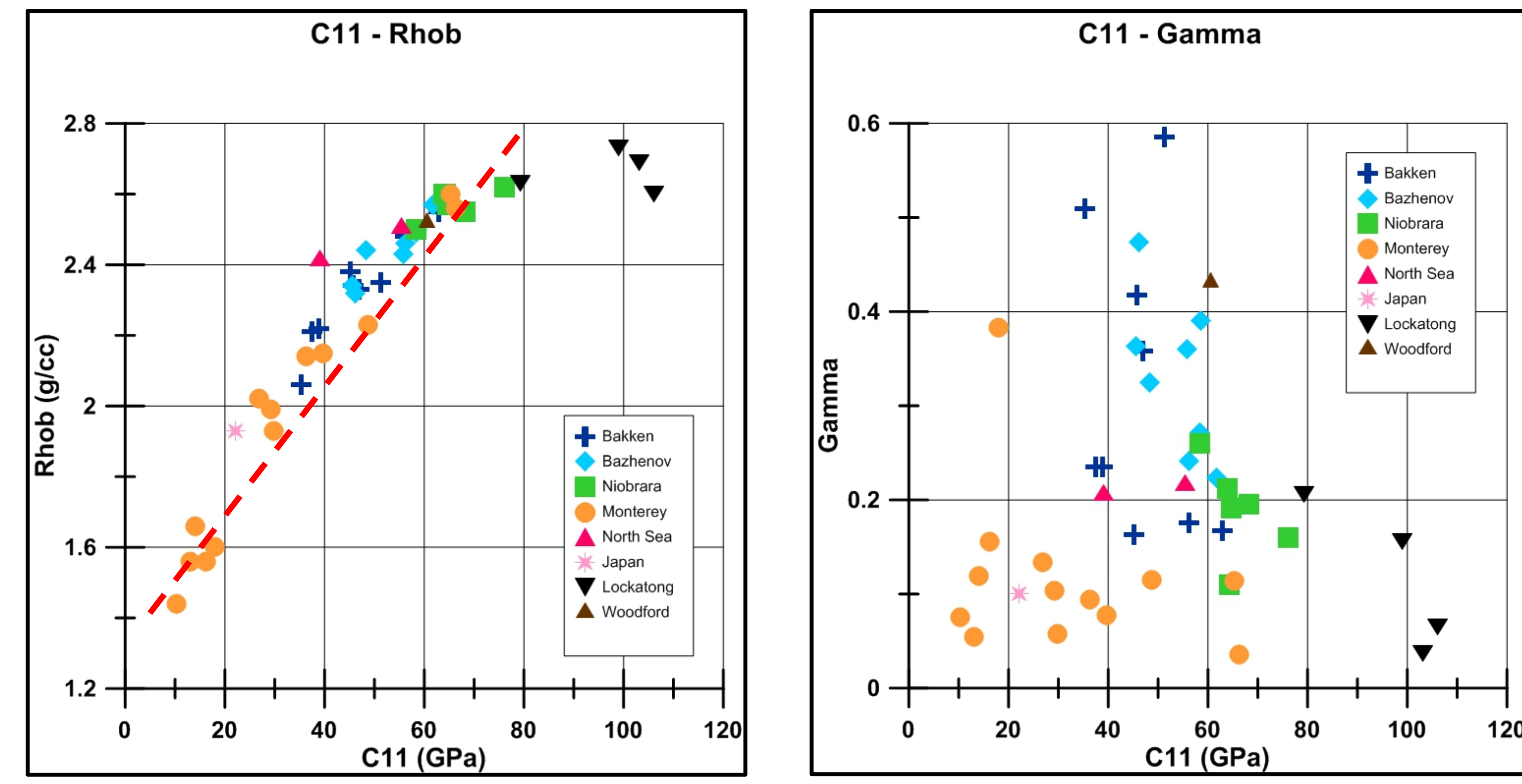
Methods



Conclusions

- Unconventional core samples, Pc 30 MPa
- Three principal components
- 1. Bulk density (ρ_b)
- 2. Kerogen
- 3. BET surface area

Results



References

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