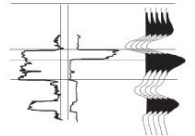# PetroSEIS

Multi-Mineral Petrophysics

PetroSEIS

Fully determined

Standard Under-determined Multi-Mineral Solutions
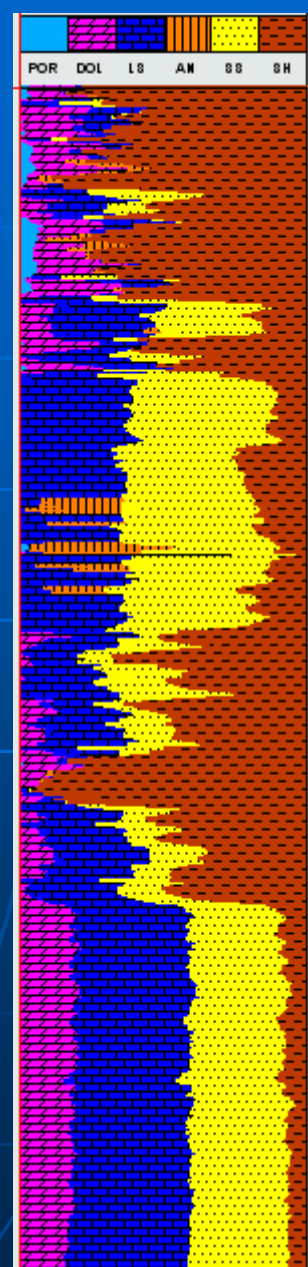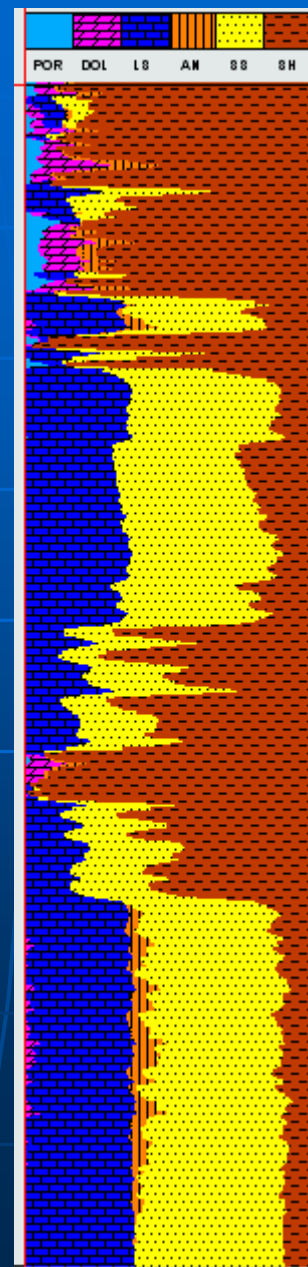
GR, Dt, N, D, Pe   **GR, N, D, Pe**   **N, D, Pe**   **GR, N, D**   **GR, Dt, N, D**

POR DOL LS AN SS SH
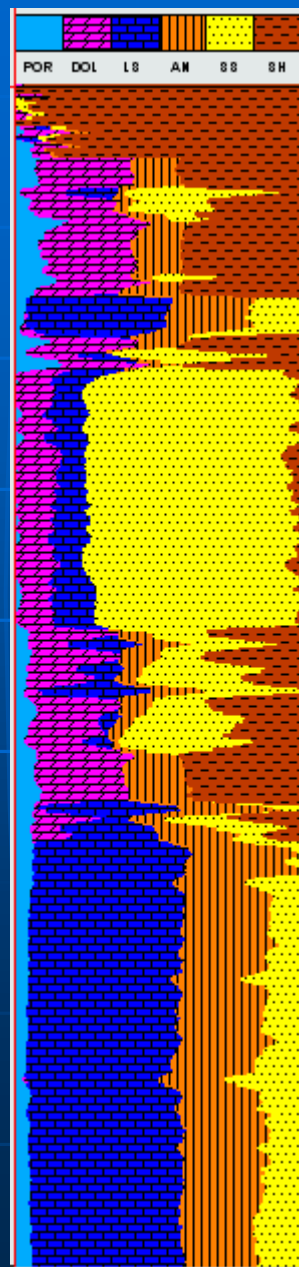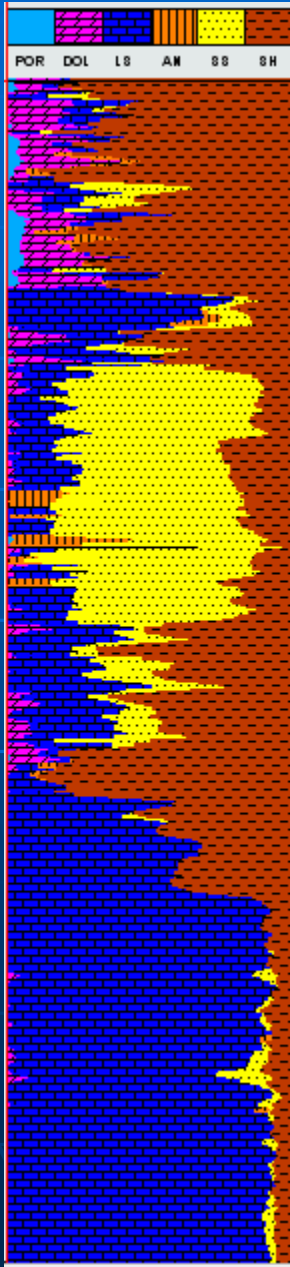
Fully determined

GR, Dt, N, D, Pe

PetroSEIS Proprietary Fully determined Multi-Mineral Solution

GR, Dt, N, D, Pe

Why are they not identical?

Fully determined (equal number of equations & unknowns) doesn't require the solutions be real (volumes fall between 0 and 1; & sum of fractional lithologies equal 1).

1) **How do you handle negative volumes? (or a volume greater than 1?)**

2) **What do you do about sum of lithologies not equal to 1?**

Fully determined

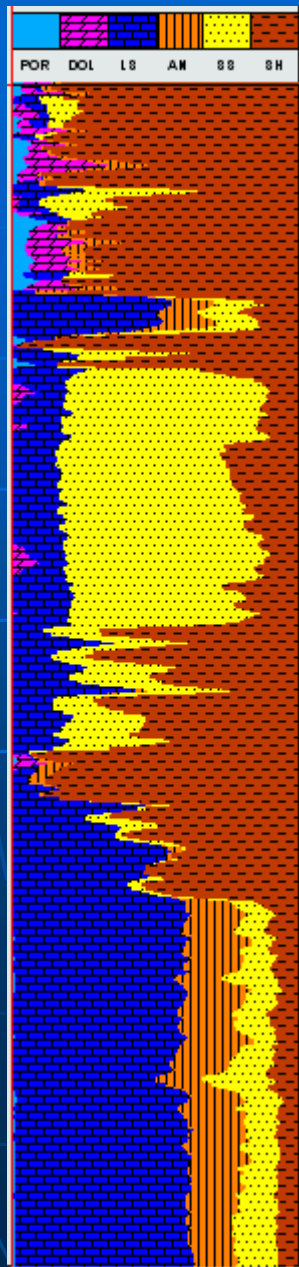**Standard Under-determined Multi-Mineral Solutions**

GR, Dt, N, D, Pe   GR, N, D, Pe   N, D, Pe   GR, N, D   GR, Dt, N, D
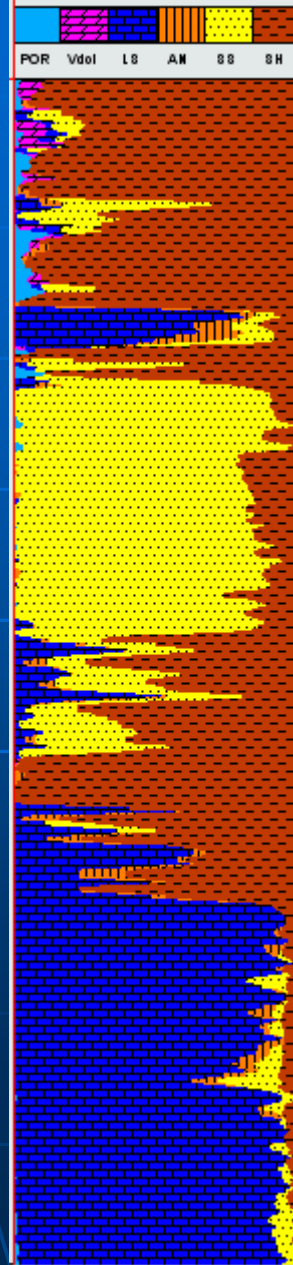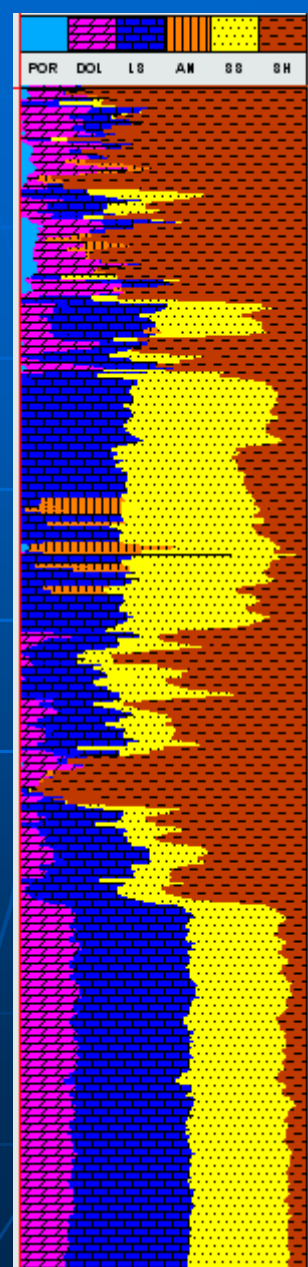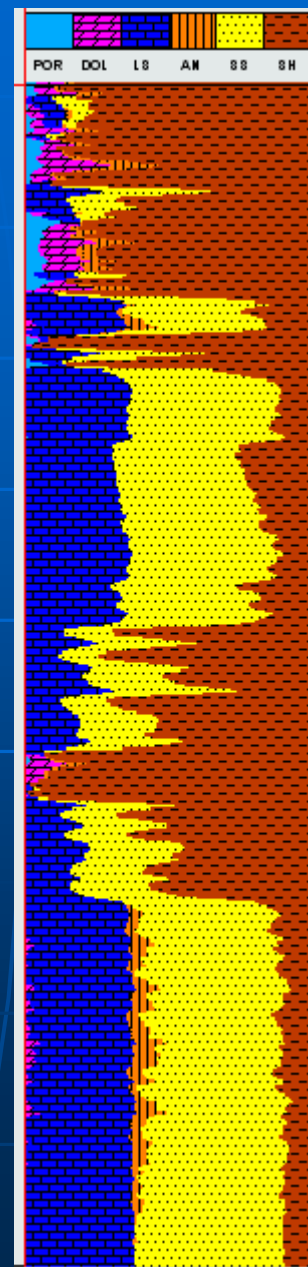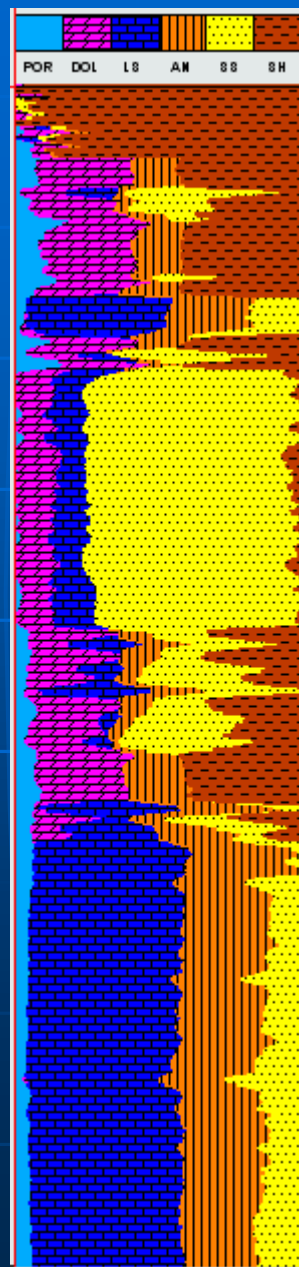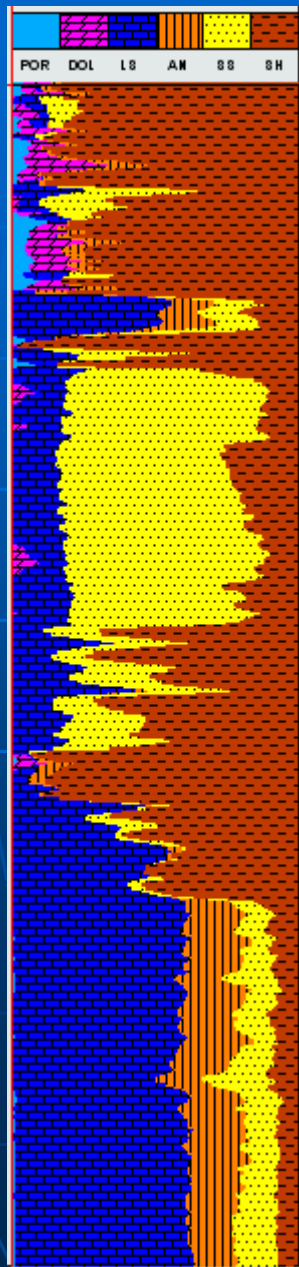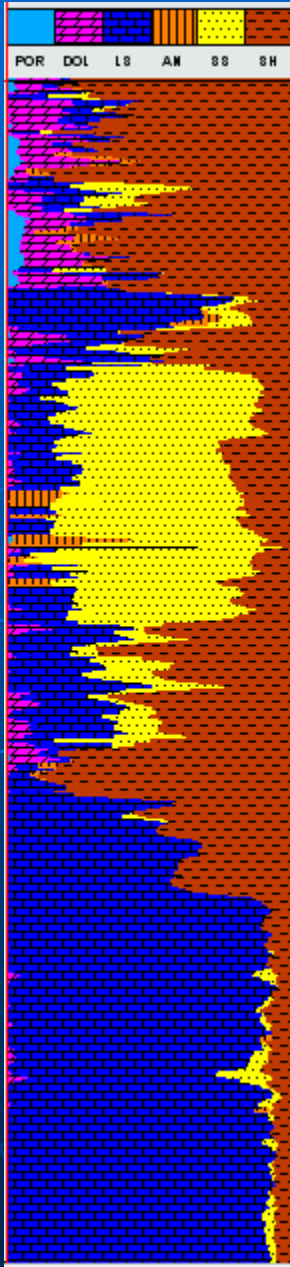
Fully determined

PetroSEIS Proprietary Under-determined Multi-Mineral Solutions

GR, Dt, N, D, Pe | GR, N, D, Pe | N, D, Pe | GR, N, D | GR, Dt, N, D

Fully determined

PetroSEIS Proprietary Under-determined Multi-Mineral Solutions
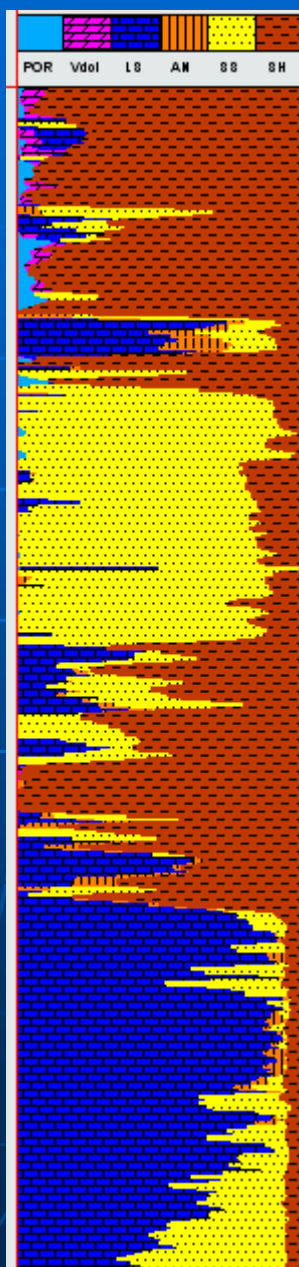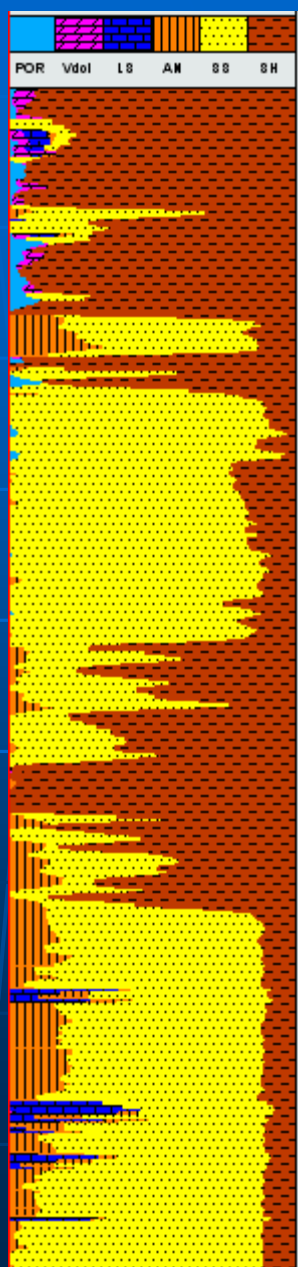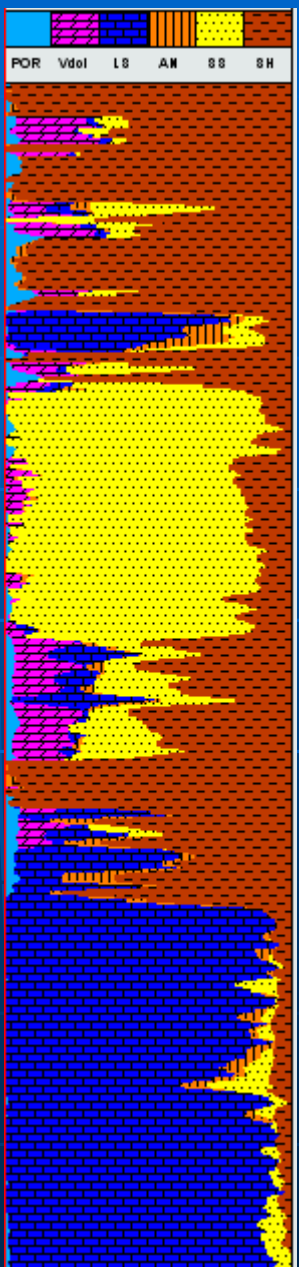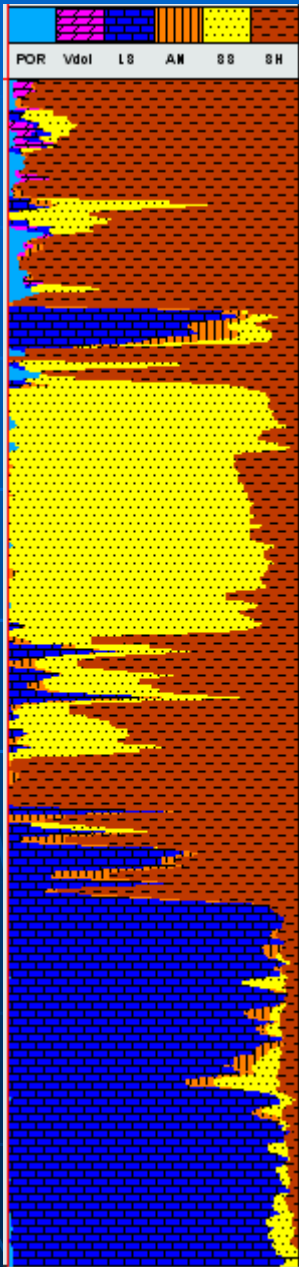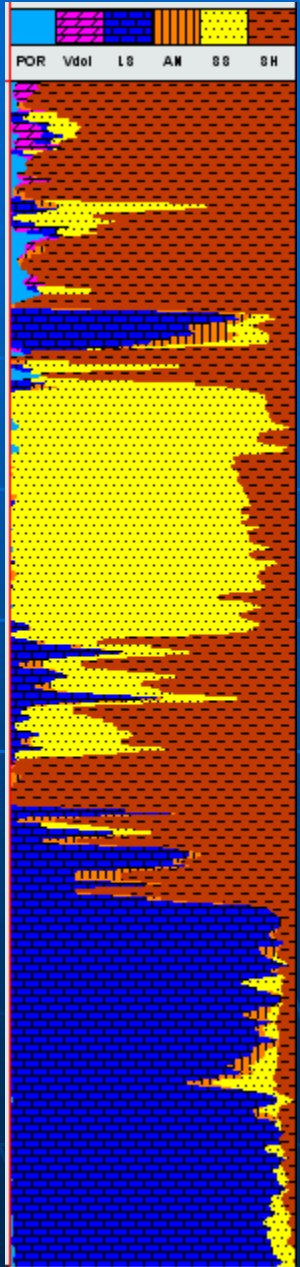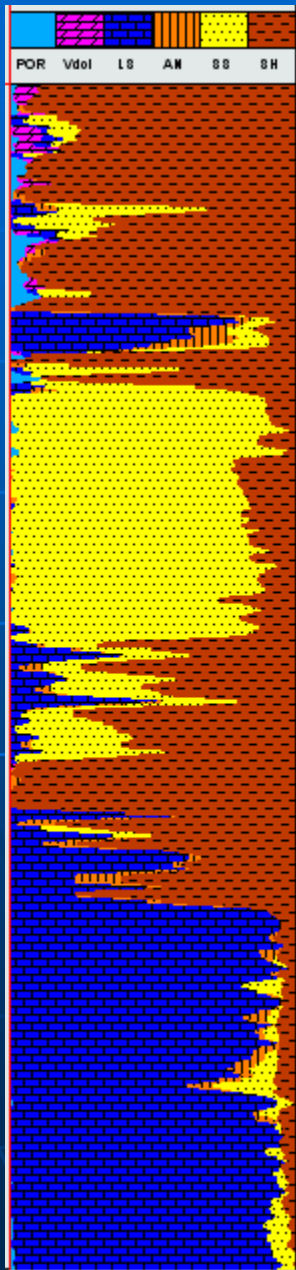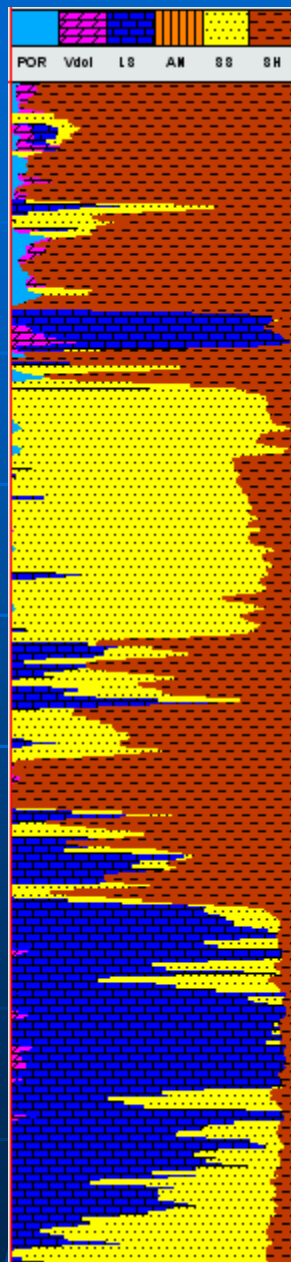
GR, Dt, N, D, Pe

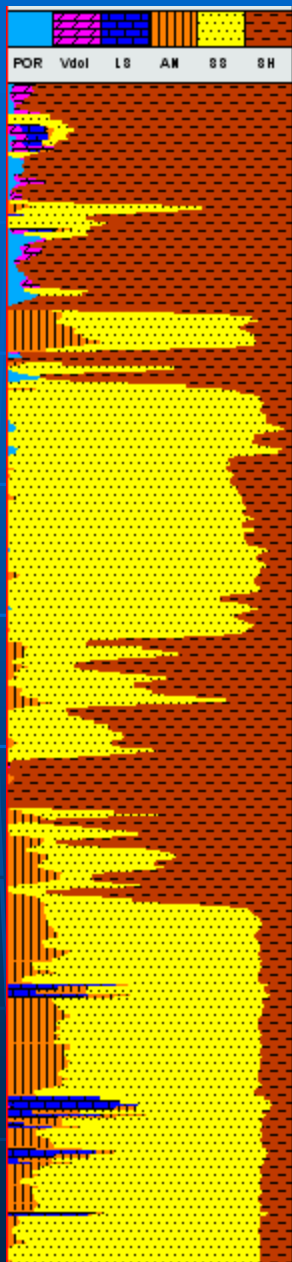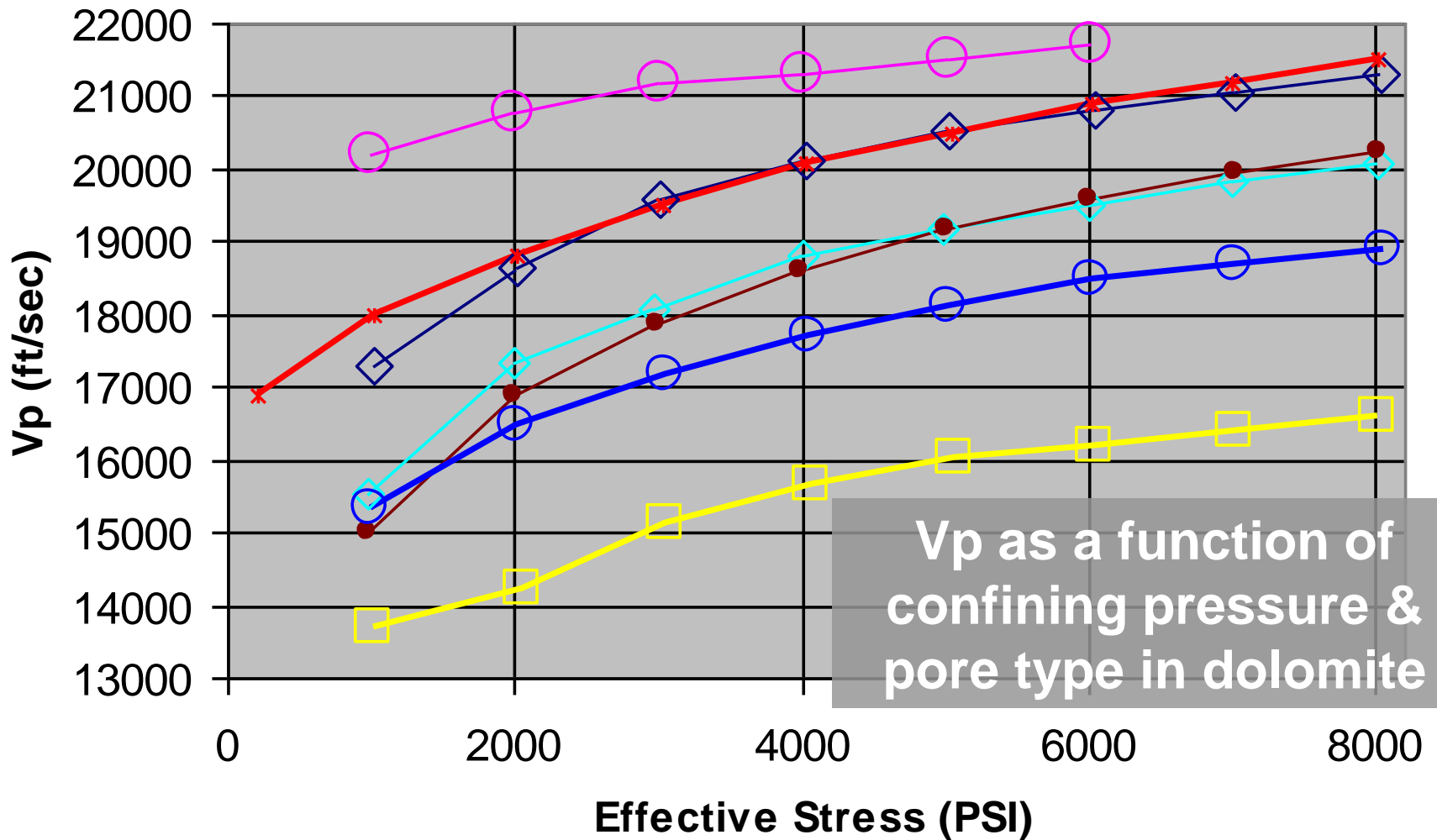**GR, N, D**

GR, N, D

Solving for shale, dolomite, limestone, sandstone, & anhydrite.

Solving for shale, dolomite, limestone, & sandstone.

Vp as a function of confining pressure & pore type in dolomite

Time Average matrix

Matrix Dt as a function of confining pressure & pore type in dolomite

Textbook: Matrix Dt

Dtma (usec/ft)

Effective Stress (PSI)

◇ 15.5% moldic porosity
□ 14.1% vug & channel porosity
✳ 3.1% fracture porosity
○ 10.8% intercrystalline porosity
○ 7.9% vug porosity
◇ 11.7% fenestral porosity
● 1.3% porosity with stylolites

Multi-mineral petrophysics Conclusions

• Standard under-determined solutions leave a lot to be desired with respect to lithology and porosity results.

• The proprietary PetroSEIS results for under-determined solutions are generally quite superior to the standard industry methods.

• If the object is to model velocity response to changes in lithology, porosity or change in stress (ie depth), it is better to have sufficient petrophysical measurements to obtain good results without the use of sonic measurements.