

# Image Based Petrophysics

Task Fronterra Geoscience can extract much useful *petrophysical* information from electrical borehole image data.

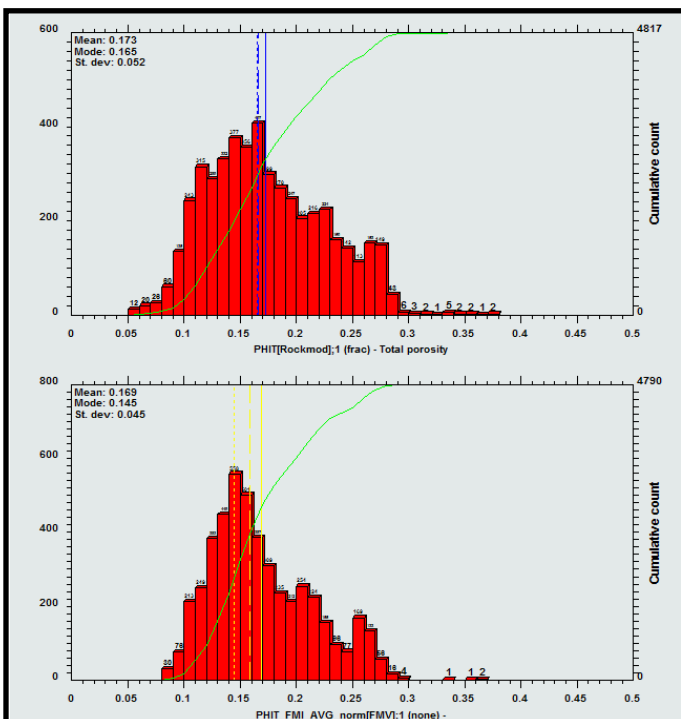
Typically, electrical borehole images are used to determine bedding orientation, fracture type and orientation, and depositional/diagenetic facies.

However, the fine vertical spacing and nearly complete circumferential coverage of the imaging tool allow heterogeneities in rock properties (porosity, permeability, rock type) to be more accurately obtained than is possible with traditional wireline measurements.

Using borehole image data, Task Fronterra calculates porosities for each tool button at each depth increment.

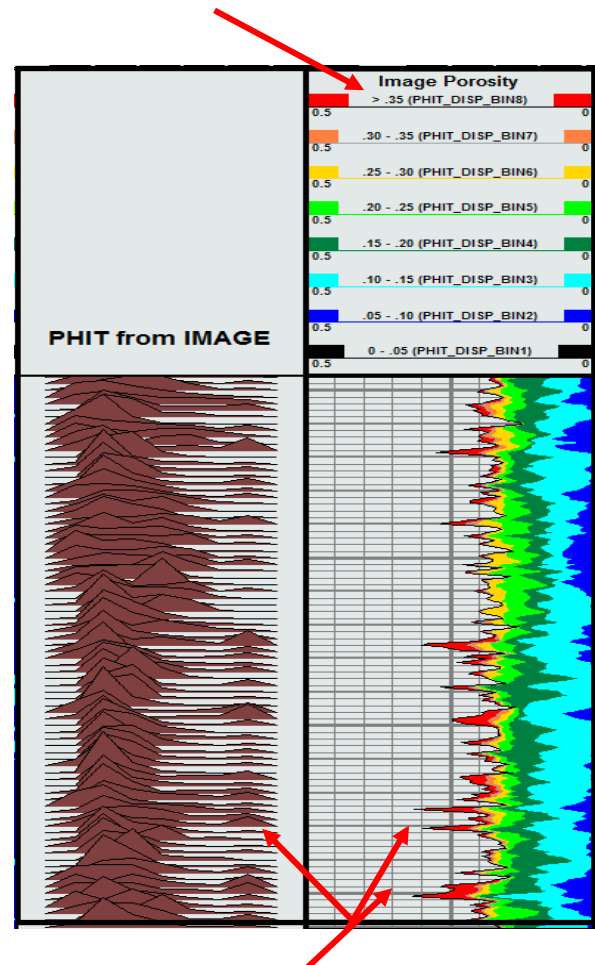
## Porosity computed from electrical images compares well to porosity from wireline

- Upper histogram shows total porosity from neutron/density
- Lower histogram shows total porosity (normalized) from image tool



## Heterogeneous distribution of porosity around the borehole can be computed and displayed

- In many carbonate rocks porosity is not uniformly distributed around the wellbore
- Due to their highly azimuthal nature, conventional wireline tools cannot measure that distribution
- Additionally, the computed porosities can be binned similar to porosity computed from NMR

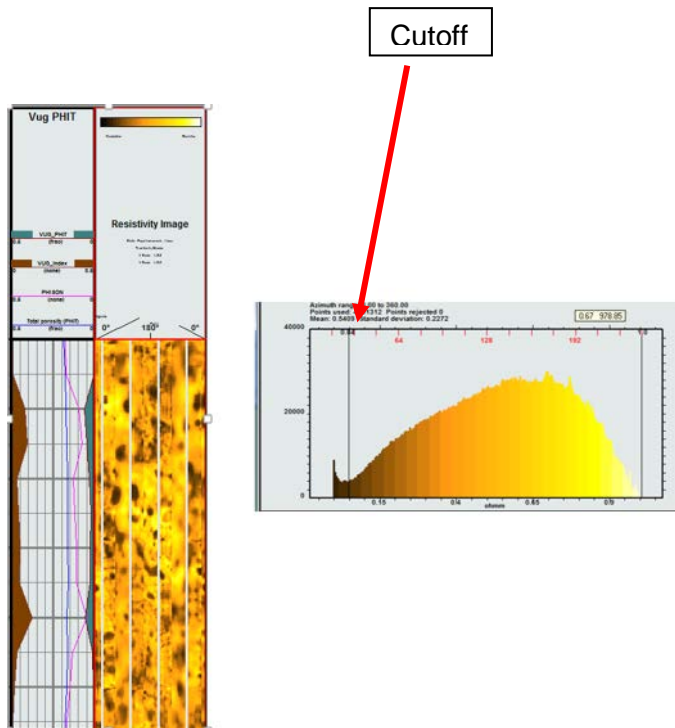


## Porosity from image data can identify high porosity intervals which may escape detection by ordinary wireline evaluation

- Wireline porosity data is, at best, the average porosity (in one direction perpendicular to the well) in an approximately 2 ft. thick interval

**Borehole images are invaluable in quantifying reservoirs with three porosity systems (matrix, fracture, vugs)**

- In addition to estimating fracture porosity borehole images can be used to estimate vuggy porosity
- Resistivity values can be histogrammed so that a cutoff value can be picked to delineate vuggy porosity

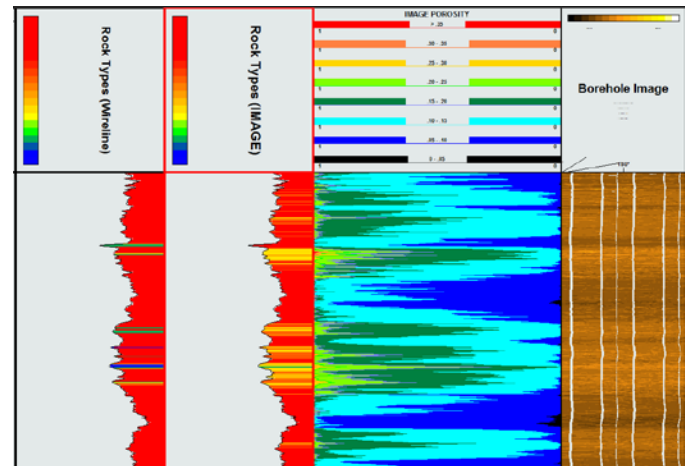


- Using the cutoff from the histogram, the fraction of image with vuggy porosity can be calculated
- The image-derived vuggy porosity can then be plotted and compared to the unconnected

vuggy porosity determined from the difference of the N-D porosity and the sonic porosity

**Rock-typing from cluster analysis of image porosity can be used for reservoir modeling**

- Reservoir simulation models require identification of rock types with similar storage and flow characteristics
- In the past statistical methods such as Cluster Analysis and Principal Component Analysis have been applied to wireline data to help populate reservoir models
- These statistical methods can also be applied to the porosity bins generated from borehole images
- Rock-Types from wireline curves can be compared to, or combined with, those from images (based on porosity bins)



*Task Fronterra Geoscience is a global independent provider of industry leading, integrated geoscience solutions, from single well analysis to complete reservoir studies.*