Mathematical and Numerical Modeling of Ultrasound Vibro-Acoustography

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Oil Exploration
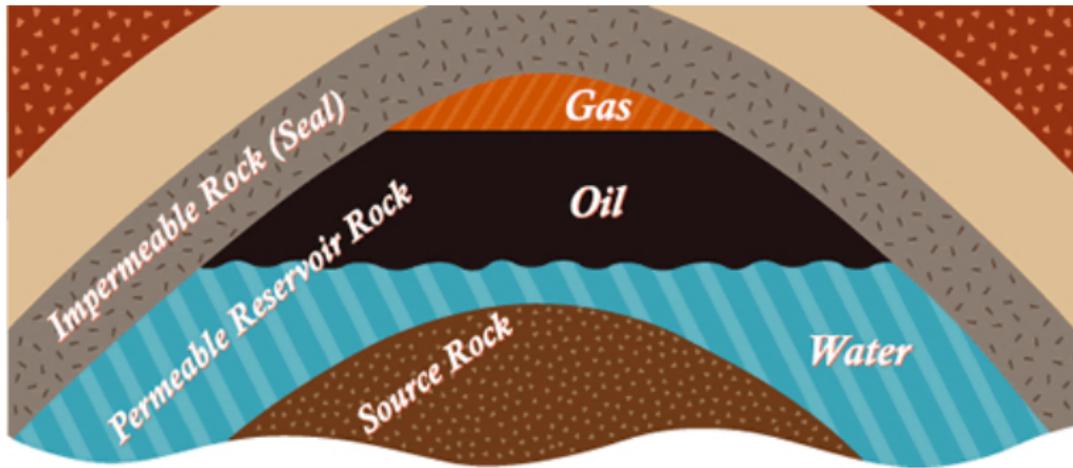
From http://www.pgesafetyeducation.com. Image courtesy of Pacific Gas and Electric Company.

Oil Exploration
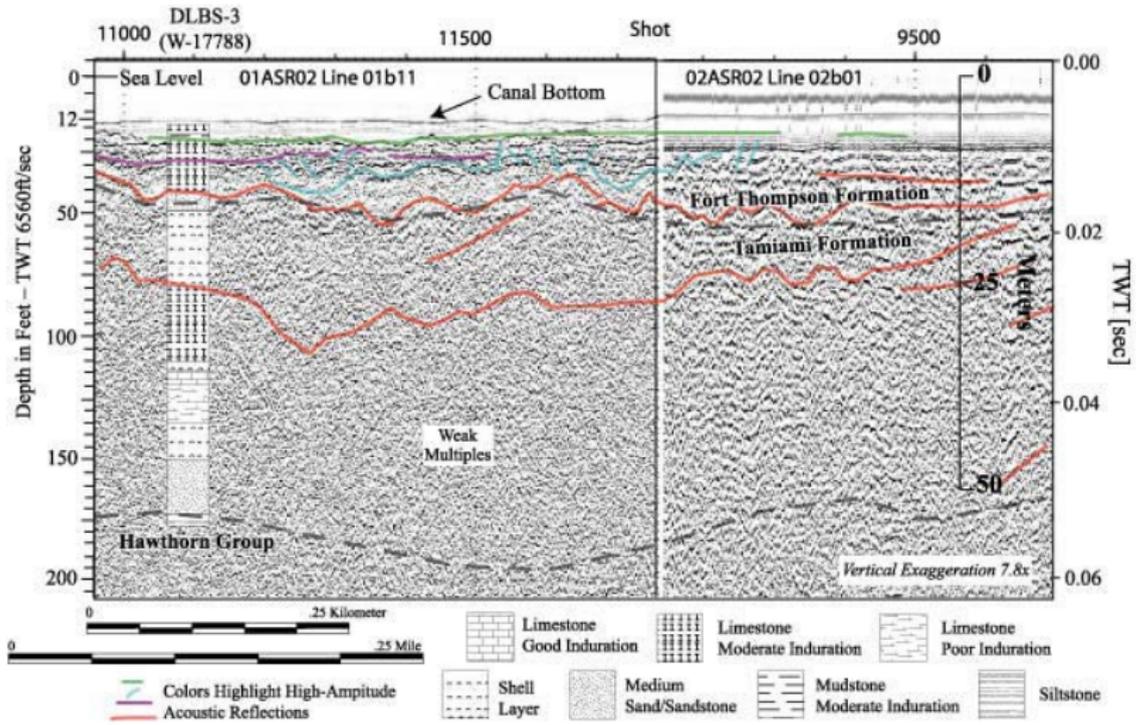
Image courtesy of USGS.

We use waves for:

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- CO_2 monitoring

Summary so far

We use waves for:

- CO_2 monitoring
- Geothermal energy
- Determining deep Earth structure
- Finding (and producing) oil

Cube

Typical wave imaging
Radon Transform
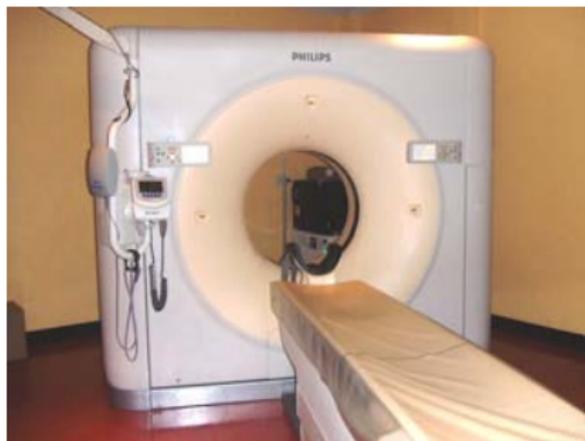
**f** - absorption of material
Rf - data
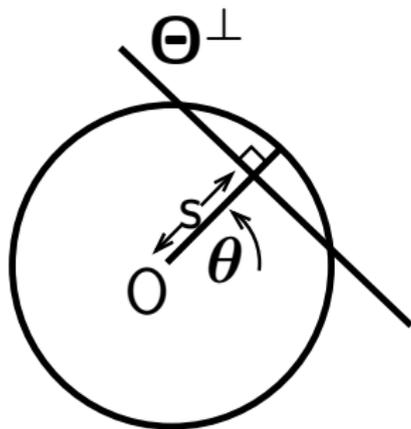
$$Rf(\theta, s) = \int_{\Theta^\perp} f(x + s\theta) dx$$

Image difference in absorbance

Shepp-Logan Phantom

Projection-Slice Theorem

$$\widehat{\mathrm{Rf}}(\sigma) = (2\pi)^{(n-1)/2}\hat{\mathrm{f}}(\sigma\theta)$$

back-project data along lines

Image difference in absorbance

12.445 Oral Communication in the Earth, Atmospheric, and Planetary Sciences
Fall 2010