Advanced Reservoir Imaging using Frequency-Dependent Seismic Attributes
(with University of Houston 15503)

Objectives of the Project:

- Develop an advanced imaging and interpretation technology based on frequency and incident-angle dependent seismic attributes
- Low-frequency asymptotic analytical solutions for seismic waves reflected from fluidsaturated layers will be developed and validated
- Scalability relations between field and laboratory model parameters will be investigated.
- The new technology will be validated by processing field data provided by industry partners and comparing the predicted fluidsaturation model to the one derived from well data.

Results of the Project:

- None located but email sent to PI on 20051215 requesting graphics, publications, and results

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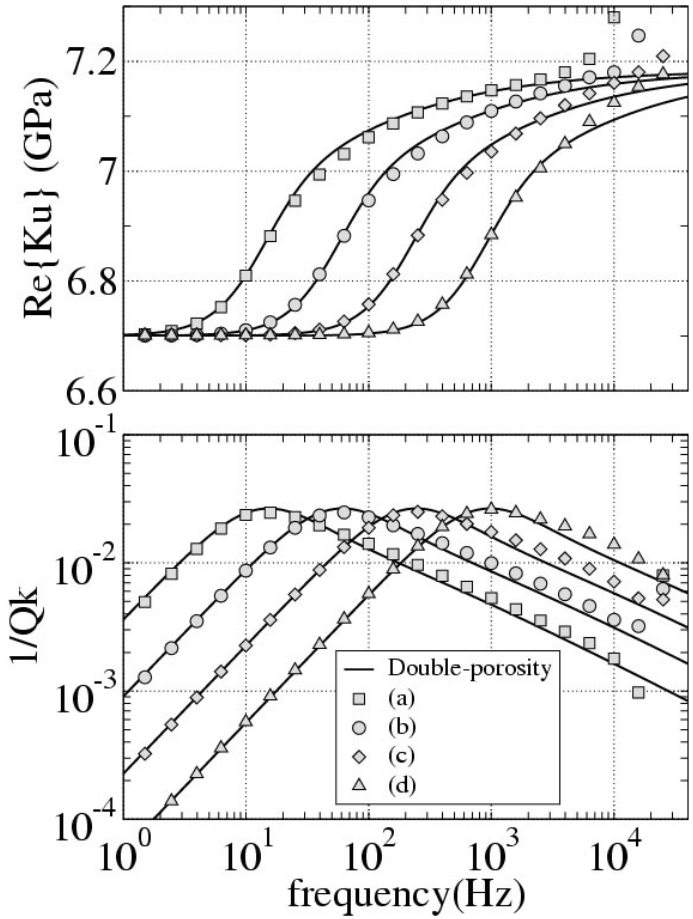
FEW ESD04-029

Source: LBL

Measuring and Intrepreting Seismic Attrubutes – (with 15505 Colorado School of Mines)



Objectives of the Project:

- Perform laboratory measurements of the seismic velocities and attenuation across the entire seismic band of frequencies on rocks that have been well characterized

Compressional attenuation and dispersion as numerically determined using LBNL's finite-difference solutions to the poroelastic governing equations (symbols) for the various geometries are shown in the top panel. Also shown (solid lines of second panel) are the analytical results of Pride et al. (2004), obtained without fit parameters to the same geometries.

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Source: LBL

Measuring and Intrepreting Seismic Attributes – (with 15505 Colorado School of Mines)

Results of the Project:

- Heterogeneity of the elastic properties of rocks at the scale of mm to cm (so-called “mesoscopic scales”) is responsible for a highly variable fluid pressure response across these same scales when the rock is squeezed by a seismic wave.
- Subsequent fluid flow due to such wave-induced fluid pressure gradients provides significant amounts of seismic attenuation.
- A highly efficient poro-elastic finite-difference modeling code that allows the mesoscopic-scale fluid flow induced inside of a rock by a passing wave to be numerically determined.
- Code allows calculation of the attenuation (*1/Q*) and seismic velocity for a given synthetic rock sample which has led to significant insight both to the mechanism responsible for seismic attenuation, and to what new information measuring attenuation can bring.
- Demonstrated that when the mesoscopic heterogeneity is distributed as a self-affine fractal having a Hurst exponent b, the attenuation as a function of frequency *f* follows the power law $Q(f) = f\ b$. Three journal articles based on these numerical experiments are in the final stages of preparation.

Source: LBL