GP170 – 2001

Rock Physics Reservoir Characterization

Jack Dvorkin and Amos Nur

Syllabus

#01 (09.01) Impedance-porosity transforms from well data. Rock physics definitions. Concept of rock physics diagnostic. Han’s data set. Models for fast sandstones. First homework assignment – Han’s data set.

#02 (11.01) Pore fluid and elasticity of rock. Methods of pore fluid substitution. Pore fluid effect on impedance and Poisson’s ratio. Patchy saturation.

#03 (16.01) Fluid effect as seen in well logs. Example from Gulf Coast. Principles of calculating saturation and porosity from well log data. Common fluid for rock physics diagnostic. Second homework assignment – Fluid substitution.

#04 (18.01) Competing effects of pore fluid and pore texture – case study. Effective medium models for granular rocks.

#05 (23.01) Effective medium models for granular rocks – continuation. Rock physics diagnostic via effective medium models. Third homework assignment – Identifying and explaining trends in well log data.

#06 (25.01) Rock physics diagnostic of North Sea sands. Heimdal case study.


#08 (01.02) La Cira case study. Using well logs and core data to understand impedance-porosity transforms. Fifth homework assignment – Synthetic seismic modeling on well log data, normal incidence.

#09 (06.02) La Cira case study. Developing a unified transform. Impedance inversion and interpretation. Upscaling of rock physics trends.

#10 (08.02) Binary mixtures and horse-shoe cross-plots from well logs. La Cira. North Sea. Sixth homework assignment – AVO effect modeling from well logs.


#12 (15.02) Uplifted sandstone case study – continuation. Seventh homework assignment – Rock physics diagnostic on well log data.

#13 (20.02) Consolidated sands – Apiay case study. Determining porosity from well logs and integrating with core data.

#15 (27.02) **Guest lecture** – Geomechanics, well logs, and seismic. *Mark Zoback.*

#16 (01.03) **Guest lecture** – Statistical rock physics. *Tapan Mukerji.* *Ninth homework assignment – Synthetic seismic forward modeling.*

#17 (06.03) Pore pressure, impedance, and Poisson’s ratio. Lab experiments on sands. Shallow geohazards – shallow water flow. Attenuation at high pore pressure. Identifying pore pressure and pore fluid in cross-plots.

#18 (08.03) Gas hydrate – geohazard and resource. Gas hydrate amount from well logs and seismic. *Tenth homework assignment – Integrating log and core data to forward model pore pressure effect.*

#19 (13.03) Permeability estimates from well logs.

#20 (15.03) Final lecture, overview, log and core data as ground truth to understanding and interpreting seismic.

*EXAM 16 and/or 17.03*