Bay Area Geophysical Society Seminar Series

Can microtomographic images help rock physics diagnostics of sandstones? Wave-induced fluid flow and a lot of measurements and computations

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In-person in Room 325 at McCone Hall (UC Berkeley campus) and on Zoom

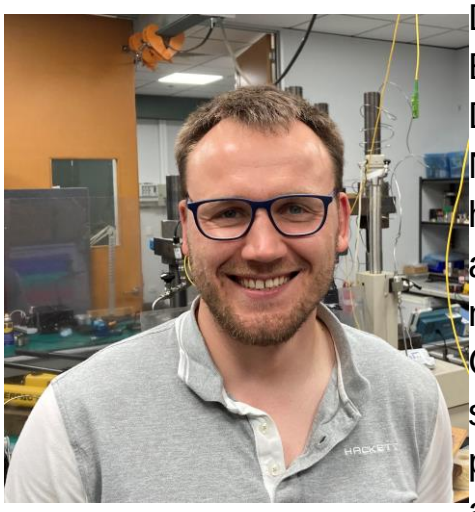
Abstract:

The essence of rock physics consists of finding relationships between pore-scale characteristics and elastic properties estimated from field geophysical measurements. For realistic rock microstructures this problem becomes prohibitively complex, so that rock physics analysis often becomes a mere data-fitting limited to either empirical relationships or theoretical models derived for simplistic microstructures like spherical grain packs. High-resolution microtomographic images of rock were thought to be a cure that may help increase the predictive power of the rock physics models. However, even with the latest synchrotron-based X-ray tomographic

microscopy cannot resolve the soft pores and grain contacts. As a result, digital rock physics simulations are known to significantly overestimate the sandstone stiffness.

The talk will present one potential approach to overcome this issue. Instead of trying to ‘resolve’ the contacts directly, we invert their geometry and properties from a set of measurements on core samples. To this end, we study the pressure-sensitivity of the seismic properties for varying viscosity/compressibility of saturating fluids. When augmented by a nuclear-magnetic resonance and nanoindentation tests, these measurements enable a simultaneous inversion of the minerals’ and contacts’ stiffness. The inversion itself involves a few non-trivial tricks in computational imaging and large-scale finite-element simulations. We will use a real field data set to illustrate the proposed workflow.

Presenter’s Bio:



Dr. Stanislav Glubokovskikh is a Research Earth Scientist at the Energy Geosciences Division (EGD) at the Lawrence Berkeley National Laboratory. Prior to the Berkeley Lab, he was working as a Senior Research Fellow at Curtin University (Perth, Australia) and a number of research institutions in Russia. Dr. Glubokovskikh’s contribution to the field of seismic reservoir characterization and rock physics has been recognized by several awards from the geophysical professional societies. He also serves as an associate editor for rock physics section at GEOPHYSICS. Right now, Dr. Glubokovskikh focuses on the development of novel algorithms for streamline processing/interpretation of geophysical and engineering measurements to optimize the subsurface operations, such as: hydraulic fracturing, geothermal reservoir stimulation, injection of carbon dioxide, and well completion. A completely different research topic has to do with the practical digital rock physics workflows.

Zoom meeting information:

Zoom ID: 962 5897 5448
Password: BAGS4ever