We cordially invite all those interested to the lecture of our guest
prof. Boris Gurevich (Curtin University, Perth, Australia)

Seismic attenuation, dispersion and anisotropy in porous rocks: mechanisms and models

Boris Gurevich
Curtin University and CSIRO, Perth, Australia

When: **Wednesday, June 21st, 2023 at 10 a.m.**
Where: **Lecture Hall of the Institute of Geophysics, Czech Academy of Science, Boční II/1401, 141 31 Praha 4**

Abstract:

Understanding and modelling of attenuation and dispersion of elastic waves in fluid-saturated rocks is important for a range **of geophysical technologies that utilise seismic, acoustic or ultrasonic waveforms and amplitudes. In particular, in seismic oil and gas exploration**, lateral variations of the attenuation in the overburden can distort seismic reflection amplitudes from exploration targets, leading to errors in reservoir characterisation. Conversely, seismic attenuation is ultimately controlled by subsurface properties and is thus increasingly used as an attribute for subsurface characterisation. Understanding the nature of seismic attenuation and its dependence on rock properties can make this characterisation more quantitative and robust.

A major cause of **elastic wave attenuation is viscous dissipation due to the flow of the pore fluid induced by the passing wave. Wave-induced fluid flow (WIFF) occurs as the passing wave creates local pressure gradients within the fluid phase and the resulting fluid flow causes internal friction until the pore pressure is equilibrated.** The fluid flow can take place on various length scales. Wavelength-scale fluid pressure relaxation between peaks and troughs of a passing wave is known as global or macroscopic flow as described by Biot's theory of poroelasticity. WIFF caused by spatial variations of matrix or fluid properties on a scale much smaller than the wavelength but much larger than individual pore size is known as mesoscopic flow. Most common manifestations of the mesoscopic attenuation is WIFF between pores and fractures, or between patches of rock saturated with different fluids. Pore-scale WIFF, known as local or squirt flow occurs between more compliant voids (cracks, grain-to-grain contacts) and relatively stiff pores. When the rock is compressed, much greater pressure builds up in compliant than stiff pores, resulting in the fluid pressure gradient, fluid flow and dissipation. **A similar mechanism causes very substantial seismic attenuation in rocks saturated with viscoelastic substances such as heavy oil or bitumen.** In the lecture I describe the physical nature and experimental evidence for each mechanism, and outline a consistent approach that quantifies all these phenomena.

More about the research work of prof. Gurevich can be found here:
https://staffportal.curtin.edu.au/staff/profile/view/boris-gurevich-661726c0/

David Uličný, for the management of GFÚ