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Abstract for EGU

Title: Comparison of the elastic properties of reservoir rocks in the field and the laboratory: link between seismic, sonic and ultrasonic measurements

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Elastic waves are commonly studied in geophysics. They are used for example for prospecting, to follow the exploitation of hydrocarbon reservoirs, to study the effect of fluid injection (CO_2 storage)… However, the wave frequencies used in the field (sonic – seismic measurements) are not the same as the ones commonly used in the laboratory (ultrasonic measurements), and fluid-saturated rocks are known to be dispersive, i.e the P- and S- wave velocity in fluid-saturated rock change with frequency. The comparison between field and laboratory measurements is therefore not straightforward.

In the ENS facilities, it is possible to subject samples, under pressure (1 to 30 MPa) to forced - oscillations varying from 0.01 Hz to 1 kHz (field frequencies) and 1 MHz (ultrasonic frequencies) using a triaxial cell. Axial and radial strain gauges are installed to record the resulting strains on the sample. Forced-oscillation can be done on 1) confining pressure to get the bulk modulus as function of frequency or on 2) axial stress to get the Young modulus and Poisson ratio as function of frequency. With this information, it is thus possible to deduce the P- and S- wave velocities with frequency.

The elastic properties were measured on different samples from the Libra oil field, for which logging measurements are available. Thus, the measurements obtained in the laboratory can be compared to the measurements in the field at the same frequency. In addition, the evolution of the velocity with frequency measured in the laboratory allows us to discuss the mechanisms at the origin of the dispersion.