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# Laboratory measurements of seismic attenuation in partially saturated rocks

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Laboratory measurements of seismic attenuation and transient pore fluid pressure are performed on partially saturated Berea sandstone and synthetic borosilicate samples. Various degrees of water (liquid) and nitrogen (gas) saturation are considered. These measurements are carried out at room temperature and under confining pressures varying from ambient conditions up to 25 MPa. The cylindrical samples are 25 cm long and have a diameter of 7.6 cm. In the context of the experimental setup, the solid frames of both the Berea sandstone and the borosilicate samples can be considered homogenous, which in turn allows for isolating and exploring the effects of partial saturation on seismic attenuation. We employ the sub-resonance method, which is based on the application of a time-harmonic vertical stress to the top of the sample and the measurement of the thus resulting strain. For any given frequency, the attenuation is then inferred as the tangent of the phase shift between the applied stress and the observed strain. Using five equally spaced sensors along the central axis of the cylindrical sample, we measure the transient fluid pressure induced by the application of a step-function-type vertical stress to the top of the sample. Both the sensors and the sample are sealed off with the regard to the confining environment. Together with the numerical results from corresponding compressibility tests based on the quasi-static poroelastic equations, these transient fluid pressure measurements are then used to assist the interpretation of the seismic attenuation measurements.