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Influence of fluids on the elastic wave velocities of sandstone and quartzite across the $\alpha - \beta$ qurtz transition at high pressure and temperature

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The ultrasonic measurements of elastic wave velocities as a function of temperature at a constant high pressure indicate an anomalous behavior of wave velocities in quartz-bearing rocks (sandstone and quartzite) at temperatures at which the $\alpha - \beta$ transition in the quartz crystals is showed. The a-b quartz transition is associated with a small decrease in velocity of compressional waves when approaching the transition, and with a significant velocity increase after the transition. At present the principal information about the structural and material composition of the Earth's interior is derived from seismic measurements. However, the interpretation of the elastic wave velocity data in terms of distribution of the material and structural composition with depth is still difficult especially in the presence of fluids. Water and mineralized fluids in the crust have essential influence on elastic wave velocities in rocks and melts. The a-b quartz transition and silicification is process connected transformation of rock's microstructure and increase of density. Geophysical investigations revealed the existence of zones in the Earth's middle and upper crust with anomalous seismic velocities. The nature of these zones is still under debate, although there are some indications that they might be correlated with change of microstructure, porosity, permeability and with the presence of fluids. Silicification is connected with a change of the seismic velocities in the Earth's interior. The transformation of rock's microstructure are also characterized by a kink which is associated with the à-b transition of quartz. The investigation was conducted at pressure of 300 MPa and temperature up to 650 C, and showed the strong influence of neutral and acid fluids on elastic properties of sandstone and quartzite as a result of its silicification. The permeability increases manifold, if system is subjected ultrasonic deformations. In this study high temperature centrifuge was also used in methodical

measurements. These studies can contribute to the petrophysical and geochemical interpretation of seismic measurements.