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Microdeformation and subcritical cracking in chalk

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Deformation processes in chalks, both in relation to changing pore fluids and stress conditions has been of great interest as chalk is an important reservoir rock for both hydrocarbons and ground water. Lately it has also gained interest as a potential reservoir rock for captured CO_2. Chalks are composed of large amounts of biogenic calcite grains, the skeletal debris of marine microorganisms. Its deformation is highly time and stress dependent, and governed by a transition from distributed to localized deformation at the onset of yield, affected by mechanisms such as subcritical crack growth and pore collapse. We present a microdeformation rig which makes use of thermal expansion as a means of subjecting small samples to strictly controlled tensile stresses. High resolution imaging provides resolutions down to 0.5 micrometers, enabling study of pore scale processes during slow deformation. Examples of localized and distributed deformation are presented.