Poroelasticity of high porosity chalk under depletion

The theory of poroelasticity for the elastic region below pore collapse by means of three different loading paths gives the possibility to compare the static and dynamically determined Biot coefficient for a set of experimental data with uniaxial loading on outcrop chalk performed with different levels of pore pressure. The chalk is oil-saturated Lixhe chalk from a quarry near Liège, Belgium, with a general porosity of 45%. Additionally, we compare the theoretical lateral stress to the experimentally determined lateral stress at the onset of pore collapse.

The static Biot coefficient based on mechanical test results is found to be lower than the pretest dynamic Biot coefficient determined from elastic wave propagation for the loading path and with less deviation under depletion. The calculated lateral stress is lower than the experimentally measured lateral stress depending on loading path. An explanation to this behaviour is pore pressure build up.

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