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Compaction in chalk – laboratory and field observations

Simulation and modeling group[1]

[1] Danish Offshore Technological Centre, Technical University of Denmark

The compaction of subsurface chalk during hydrocarbon production leads to technical and safety issues related to well trajectory design, wellbore collapse, seafloor subsidence, and seismic events that in turn have important economic and societal impacts (*e.g.,* the Tyra and Groningen fields). Accurate prediction of reservoir deformation over time requires a reliable experimental dataset designed to capture the mechanical behaviour of key chalk lithologies that are likely to deform in a depleted field. To this purpose, the yield surfaces *i.e.*, the tensile, shear and plastic properties, of clean Maastrichtian and Danian chalk and quartz-rich Danian chalk saturated with water and oil are reconstructed based on over 200 stress-strain measurements.

Importantly, these experimental data used to extrapolate functions between *e.g.*, porosity and yield stress, show a non-negligible data scattering, thereby raising questions about the reliability of the predicted compaction. This study also quantifies for the first time the uncertainty associated with the simulation of plastic deformation in compacting reservoirs. The workflow implemented here can be used in all chalk reservoirs to quickly assess the most mechanically unstable areas of a depleted field that need to be avoided while drilling and installing infrastructures offshore.