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Permeability and flow modelling of diatomaceous shales in the Danish North Sea

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The wells from the Danish oil and gas fields are approaching abandonment; however, the uncertainty in the permeability of overburden formations increases concern about the stability of closed wells. Miocene-age intervals of siliceous shales have been identified in the overburden (Figure 1), which can induce fracturing during diagenesis (Ishii et al., 2011). In this project, our primary goal is to construct a permeability and flow model of the overburden accounting for the presence of fractures. We have identified the boundaries of diatomaceous shales in several wells of the Danish North Sea by interpreting seismic and well-logging data.

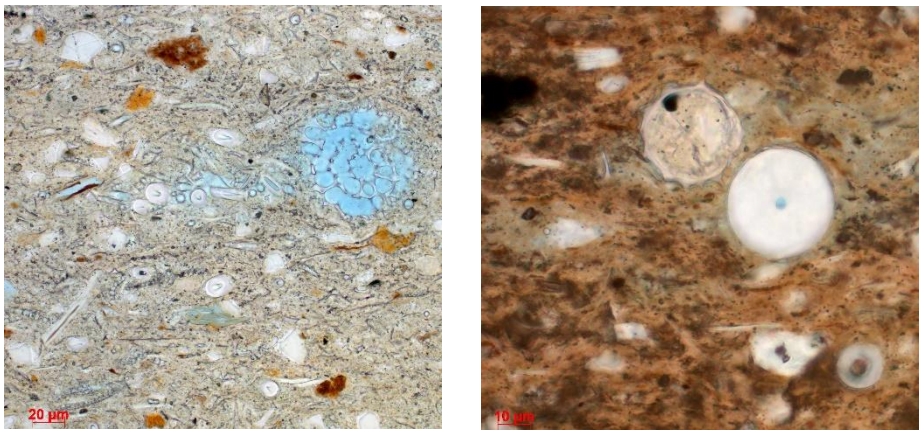
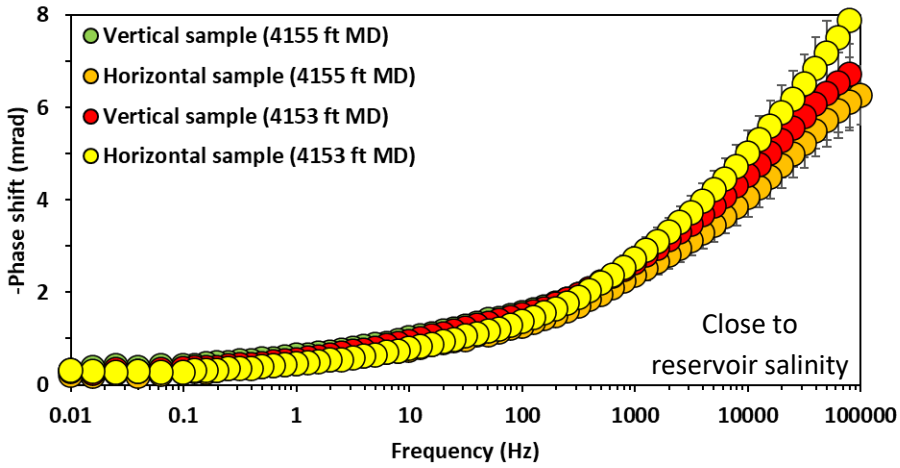


Figure 1. Petrographic images from the E-08X well in the Tyra Field, sampled from a core in the interval 4100 to 4170 ft measured depth, showing siliceous microfossils in a clay rich matrix.

To construct a matrix permeability log, we have built in the lab and measured induced polarization in siliceous samples (Figure 2), and we plan to correlate the results with polarization data from the electrical resistivity logs. The model will account for matrix permeability and flow in natural fractures.

Figure 2. Measured phase shift in four diatomaceous shale samples from the E-08X well. The occurrence of polarization above 100kHz could indicate a low matrix permeability in the samples.



References

Ishii, E., Sanada, H., Iwatsuki, T., Sugita, Y., & Kurikami, H. (2011). Mechanical strength of the transition zone at the boundary between opal-A and opal-CT zones in siliceous rocks. *Engineering Geology*, *122*(3–4). https://doi.org/10.1016/j.enggeo.2011.05.007

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