Vp-Vs relationship and amplitude variation with offset modelling of glauconitic greensand

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The relationship between Vp and Vs may be used to predict Vs where only Vp is known. Vp/Vs is also used to identify pore fluids from seismic data and amplitude variation with offset analysis. Theoretical, physical, as well as statistical empirical Vp-Vs relationships have been proposed for reservoir characterization when shearwave data are not available.

In published work, the focus is primarily on the Vp-Vs relationship of quartzitic sandstone. In order to broaden the picture we present Vp-Vs relationships of greensand composed of quartz and glauconite by using data from the Paleocene greensand Nini oil field in the North Sea. A Vp-Vs relationship derived from modelling is compared with empirical Vp-Vs regressions from laboratory data as well as from log data. The accuracy of Vs prediction is quantified in terms of root-mean-square error. We find that the Vp-Vs relationship derived from modelling works well for greensand shear-wave velocity prediction. We model the seismic response of glauconitic greensand by using laboratory data from the Nini field. Our studies here reveal that brine-saturated glauconitic greensand can have a similar seismic response to that from oil-saturated quartzitic sandstone and that oil-saturated strongly cemented greensand can have a similar amplitude variation with offset response to that from brine-saturated weakly cemented greensand.

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