

## **AVO Inversion in Marine Gas Hydrate Studies**

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### **Abstract**

Seismic studies of marine gas hydrates include attempts to determine the gas hydrate concentration above, and free-gas concentration below, the base of the gas hydrate stability field, which is usually inferred by the observation of a bottom-simulating reflector (BSR) on low frequency seismic records. One of the methods that may provide constraint on the concentration of gas hydrate and free-gas from suitable multichannel seismic (MCS) data is the study of BSR amplitude variation with offset (AVO), a method commonly used for hydrocarbon detection in the oil and gas industry. Most gas hydrate AVO studies have used forward modelling to match theoretical AVO curves with measured AVO data. However, this approach does not address the range of solutions that can satisfy the AVO problem to within data uncertainties. In this study, a nonlinear Bayesian inversion is applied to estimate one- and two-dimensional marginal probability distributions (MPD's) of physical parameters (P- and S-wave velocity ( $V_p$ ,  $V_s$ ) and density ( $\rho$ ) of both media) at a gas hydrate related BSR interface. The parameter MPD's are related to gas hydrate and free-gas concentration through a rock physics model.