



The use of large numbers of pseudo wells for seismic inversion

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Introduction

We have developed a 1D stochastic algorithm for estimating reservoir properties, based on matching large numbers of pseudo-wells to seismic angle stacks (Connolly and Hughes, 2016). The pseudo-wells are part deterministic and part stochastic 1D stratigraphic profiles with consistent elastic and reservoir properties. Pseudo-wells are sampled from a prior distribution defined by the geological interpretation, a rock physics model and a model for the vertical statistics that provides close control of the lithofacies transitions and proportions.

Method

A new set of pseudo-wells, typically 10^3 – 10^4 tied to the local stratigraphy, is constructed for each seismic trace. Synthetics, derived from the pseudo-wells using extended elastic impedance (Whitcombe et al., 2002), are matched to either one or two seismic angle stacks, and the best matches are selected and averaged to provide a joint estimate of reservoir properties and impedances and the associated uncertainties.

Results

The algorithm has been tested on a number of data sets and validated by blind well ties (Connolly and Hughes, 2013 & 2014).

Discussion and Conclusions

The success of the inversion is dependent on highly realistic pseudo wells that sample the full range in rock properties and lithology layering expected. In turn the pseudo wells are underpinned by the rock physics model and it is important that this is constructed from carefully quality controlled log data with robust interpretations of rock property relationships.

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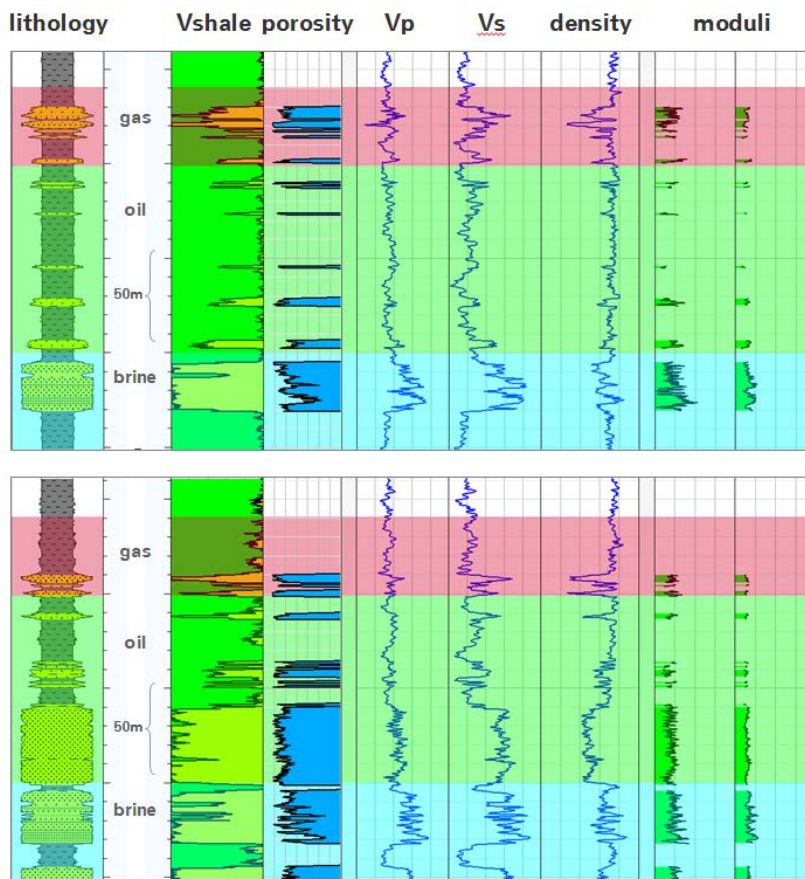


Figure 1: Sets of log curves for two wells; one is real the other a pseudo well (Connolly and Hughes, 2013)

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