

FROM SHOT RECORDS TO ROCK AND PORE PARAMETERS, THE DELPHI APPROACH (D-1)

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We propose a stepwise procedure for transforming multicomponent shot records at the surface into the rock and pore parameters of a target zone. We distinguish the following three processing stages:

(1) Pre-processing at the surface

(a) The multicomponent seismic shot records are decomposed into pure P- and S-wave responses.

(b) The multiply reflected and converted waves related to the free surface are removed.

Note that in this stage no information about the subsurface is required.

(2) Reflectivity imaging in the subsurface

(a) The macro-subsurface models for P- and S-wave propagation are estimated from the primary P- and S-wave responses, respectively.

(b) The primary P- and S-wave responses are migrated independently, yielding structural information of the subsurface in terms of R_{pp} , R_{ps} , R_{sp} and R_{ss} , optionally as a function of incidence angle.

Note that in the latter step we can rely on existing scalar algorithms.

(3) Post-processing in the target zone

(a) The angle-dependent reflectivity information in the target zone is transformed into the detailed elastic parameters c_p , c_s , and ρ .

(b) The elastic parameters c_p , c_s , and ρ are transformed into the rock and pore-parameters of the target zone.

Note that in the latter step additional non-seismic information is a prerequisite. Therefore, post-processing in the target zone should be assisted by an integrated E & P data base.

It is argued that the stepwise inversion approach allows full control on the validity of each individual step by user-interaction. This means that the next step is only applied if the result of the previous step is found to be acceptable.

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