Adaptive decomposition of 4-C ocean bottom data into up- and downgoing P- and S-waves

Application to data from the Snorre field.

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Multicomponent ocean-bottom aquisition, where the particle velocity vector and the pressure are measured (4-C data), enables us to apply a wavefield decomposition into up- and downgoing P- (and S-) waves. Such a decomposition of ocean-bottom data can be applied in two ways. An *acoustic* decomposition can be performed just above the ocean-bottom, giving the up- and downgoing pressure fields in the water. Or an *elastic* decomposition can be performed just below the ocean-bottom, in which case the up- and downgoing P- and S-waves are obtained. The latter result can then be used in further processing (i.e. imaging and characterization).

The elastic decomposition procedure, based on the wave equation, only requires knowledge of the medium parameters just below the receiver level. However, due to imperfect geophone coupling and unknown medium parameters, application of decomposition to field data is not straightforward. By separating up- and downgoing wavefield decomposition and P- and S-wave decomposition from each other the resulting decomposition equations for the first case are of a simpler form. It is then possible to apply decomposition in an adaptive way, using several intermediate decomposition results. Each intermediate result allows for the estimation of unknown medium parameters and coupling filters. In addition the quality of these results can be checked by the criteria that no downgoing waves should be present in the upgoing wavefield and vice versa. The adaptive decomposition procedure is demonstrated succesfully on a 2-D line acquired over the Snorre field.

Reference:

Schalkwijk, K.M., Wapenaar, C.P.A., and Verschuur, D.J., 1998, Decomposition of multicomponent ocean-bottom data in two steps: 68th Ann. Internat. Mtg., Soc. Expl. Geophys., Expanded abstracts, 1425-1428