SURFACE-RELATED PREPROCESSING OF MULTICOMPONENT SEISMIC DATA (P-32)

P.HERRMANN, C.P.A. WAPENAAR and A.J. BERKHOUT

To extract the elastic properties of the subsurface from seismic data generated by multi-component sources and recorded by multicomponent detectors, we have the choice of either working with the velocities and stresses using the full elastic Kirchhoff-Helmholtz integral, or with the P and S scalar potentials. The disadvantage of using the full elastic Kirchhoff-Helmholtz integral is that the whole multicomponent data set has to be treated simultaneously. By working with the P and S scalar potentials, and thus on separate PP, PS, SP and SS data panels, it is possible to treat the different modes of wave propagation independently. This has three important advantages:

- reduction of the amount of data to be treated at one time,
- possibility of estimating the involved P and S macromodels separately,
- processing, applied on the different data panels, is similar to acoustic processing.

We show on simulated data how a two-component seismic land data set, using horizontal and vertical stress sources, can be transformed into PP, PS, SP and SS data panels (the subsurface exhibits lateral and vertical variations of the elastic properties). Comparison of the PP panels with acoustically-simulated data over the same subsurface demonstrates the vital importance of the decomposition process. The data handling of the decomposition process is similar to that used in prestack migration. In the case of a homogeneous near-surface layer we work in the frequency-wavenumber domain; in the case of an inhomogeneous near-surface layer we work in the frequency-space domain. In addition, as in the estimation of subsurface velocities by the prestack migration process, the near-surface velocities (P and S) can be estimated by inspection of the quality of the decomposition process.

Delft University of Technology, Laboratory of Seismics and Acoustics, P.O. Box 5046, 2600 GA Delft, The Netherlands

52nd annual EAEG meeting, Copenhagen