VSP-SIMULATION FROM SURFACE DATA (B-29)

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Most methods for simulating VSP data are based on forward modelling schemes. Because a 'macro-subsurface model' is generally used as input for modelling schemes, the simulated data do not contain detailed information of the real earth. In this paper a new method for VSP-simulation is introduced. It will be shown that it is possible to simulate VSP data by downward extrapolation of surface data. Again the macro-subsurface model is used as input (to define the extrapolation operators). With this new approach, however, the simulated VSP data do contain the main events (related to the boundaries in the macro-subsurface model) as well as detailed information of the real earth.

In our scheme we make use of the full elastic two-way downward extrapolation operator, which enables a correct handling of multiples and wave conversions. The operator is used efficiently in the wavenumber-frequency domain, therefore only 1D macro-subsurface models will be considered. However, for the detail in the subsurface we do not demand this 1D restriction. During the presentation VSP simulations for various offsets and borehole configurations will be discussed. Finally, it is important to realize that the proposed VSP simulation procedure enables very accurate macro-subsurface model verification: if the simulated VSP data are physically unacceptable (upgoing waves at smaller times than the downgoing source wave, etc.) then the chosen macro subsurface model is incorrect and a new model must be defined.

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