THREE-DIMENSIONAL MIGRATION. I. PRE-STACK DOWNWARD EXTRAPOLATION BY SINGLE SHOT RECORD INVERSION (B-10)

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In areas with complicated structures, 2-D as well as 3-D, post-stack migration techniques give a poor image of the subsurface because diffraction energy and conflicting dips are not treated correctly by Common Mid-Point stacking. Therefore, in the past few years much research has been done on the development of pre-stack migration techniques. Because of the enormous amount of data to be processed in full 3-D pre-stack migration, serious attention has been paid so far only to 2-D pre-stack migration. Various techniques have been developed which are satisfactory when a 2-D subsurface may be assumed. However, for complicated 3-D-inhomogeneous structures, 3-D pre-stack migration becomes necessary. Even with the new generation of fast vector computers, full 3-D pre-stack migration is still unthinkable, so compromises need to be made. An interesting solution appears to be the 3-D version of the Dip Moveout technique. Although simple velocity models must be assumed, this solution should certainly be explored because of its efficiency, particularly when applied in the Fourier domain. In this paper a more general approach to 3-D pre-stack migration will be presented, namely the 3-D version of the Single Shot Record Inversion technique. This method, which can handle any velocity model, is very elaborate. An interesting option, however, is nonrecursive 3-D pre-stack downward extrapolation to a reference plane (for instance, the sea bottom). At this reference plane high-quality multi-fold ZO-data can be obtained by correlating the source and detector data followed by true Common Depth Point stacking. In this way, diffraction energy and conflicting dips are preserved in the stacked data. In this part of the paper some preliminary results will be shown and a benchmark on a Cray vector computer will be discussed. In part II the effect of 3-D recursive post-stack migration applied to the high-quality ZO-data will be demonstrated.

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