Paper 23

Investigation of DMO algorithms during test-line processing: some recommendations

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Seismic data processing utilizes a large suite of processes beside the skeletal needs of velocity analysis, forming a CMP stack, signal enhancement and image focusing to produce an interpretable seismic section. DMO has often been acclaimed as an industrial standard without which the stacked section would necessarily be "low tech". The purpose of this study is to isolate elements in the choice of DMO algorithms during test-line processing which might lead to a more efficient turn-over time. We summarise next in brief some practical aspects of the DMO algorithms encountered a couple of years ago in this region and to recommend a comparative procedure for quality control peculiar to our data sets.

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The Dip Movement processor in seismic data processing, or partial migration before stack is an auxiliary data processing correction that attempts to improve the quality of a seismic stack in the presence of reflection point smearing and conflicting dips. Performed correctly, velocity analysis after DMO is supposedly independent of dips and thus would allow an easier decision in, and perhaps more "correct" velocity pick. DMO algorithms available sometime back in this region are essentially Fourier transform methods, usually with some logarithmic stretch formulation or Integral/Summation (Kirchhoff-style) methods with provisions for spatial aliasing and dip constraints. Fourier transform methods are efficient and best applied to seismic data that are uniformly sampled in space. Kirchhoff-style methods are implemented instead with one input and one output trace at a time and are well suited for irregular survey geometries, missing shots, wide swaths, large variations in source-receiver distances and azimuths, large cable feathering angles, etc.

We recommend during test-line evaluation to compare the velocity spectrum at a preselected CDP location without DMO from the same location with DMO. A "better" velocity pick should be evident in the latter. We recommend next to subtract (a) the stacked section and (b) migrated section without DMO from the same with DMO. Assuming all non-DMO processing are identical, the different sections should contain **no** horizontal reflections i.e. DMO should not in any way **alter** horizontal reflections. Diffraction hyperbolas will be better preserved with DMO in (a). Fault definitions are enhanced after migration with DMO in (b) because of this preservation. Lastly DMO should **not** be used solely for suppressing high velocity linear noise and lessening back scattered energy. Other filtering options are available.