Benefit of Applying 5D Regularization and Interpolation Before Signal Processing

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ABSTRACT

Low fold coverage, gaps and large distances between receivers and shots that cause seismic acquisition foot prints, are common issues that usually appear at any seismic 3D projects, which will affect the quality of the final image. Regularized seismic data improves signal to noise ratio by removing spatial noise, enhancing the coherency and alignment of the reflection events. The result of 5D interpolation is filling the missing data which was not acquired during acquisition and creating regular fold coverage and a balanced stack. Additionally, the attribute artifacts and acquisition foot print are reduced (Satinder Chopra and Kurt J. Marfurt, 2013). This technique performs multi-dimensional Fourier data mapping/regularization. Data is processed in overlapping spatial-temporal blocks. After temporal FFT, each frequency slice is transformed into the spatial frequency domain with an irregular Fourier transform (similar to the anti-leakage Fourier transform). The reverse Transform reconstructs the energy to bin centers (regularization) or specified coordinates. Regularization places the seismic data onto a regular grid, which helps when merging multiple surveys and can be beneficial or even vital for subsequent migration. This method is tested on Sratton 3D survey from South Texas. The methodology sequence will be compared with the original processing sequence in post-stack and pre-stack domains and comparisons will be shown.