Processing Flow Development

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Abstract

In order to develop a processing flow for the 3D without the overhead of processing all of the data, I chose to use a 2D line extracted from the 3D to test processing parameters. The data were provided by Fairfield Industries from their Gulf of Mexico library as CMP gathers, with deconvolution and residual statics applied.

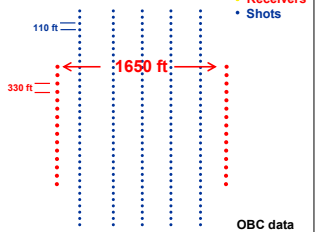
These data are noisy, so the first task was to develop a method of attenuating this noise. This process is continuing. As you can see from the example, the noise suppression is still not optimal for prestack migration and AVAF analysis.

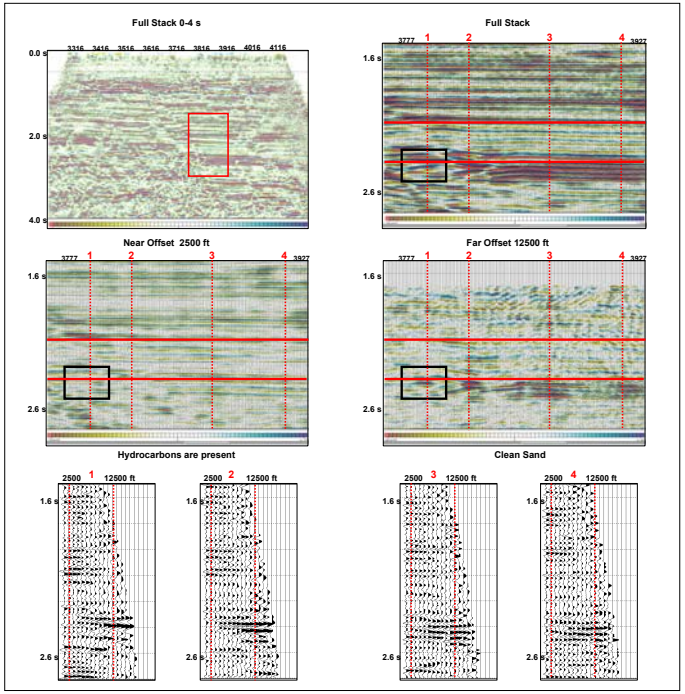
Velocity analysis is an important step for processing. From the literature (Hilterman et al, 1998), we know that anisotropic NMO is required to properly correct the offsets greater than depth. Anisotropic velocity analysis proceeds in two steps beginning with the short-spread velocity. These gathers were left unmuted so that the residual NMO beyond offset equal to depth could be viewed, but the result is that the semblance contours are based on the entire gather corrected as "most flat". Care must be taken to insure that only the nearer offsets are considered for the initial velocity. Once the short-spread velocity is selected, then eta, η, Thomsen and Tsvankin's (1994) weak anisotropic NMO parameter, can be analyzed. As Hilterman et al described, the application of anisotropic NMO flattened the data fairly well to the far offset which is about twice the depth. The velocity profile indicates a lateral trend dipping down to the right for this 2D line.

As a QC step, a stack with AGC before the stack was generated and migrated post-stack. This can be compared to the 3D pre-stack time migration of the same line displayed without and with AGC.

A display of the full stack from the Fairfield processing, and an enlarged area indicated with a box in the first display. This same enlarged area is also displayed from Fairfield's near and far stacks. Four locations are indicated on all enlarged panels that represent the four gathers that are displayed below. At location number 1, the presence of hydrocarbons has been confirmed by a well. Location number 2 has a very similar AVO signature and is also believed to be hydrocarbons. At locations 3 and 4 the AVO signature is very different. Experience in other locations has led to the interpretation of a clean sand at these two locations.

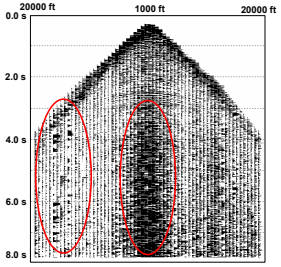
Shooting Configuration:



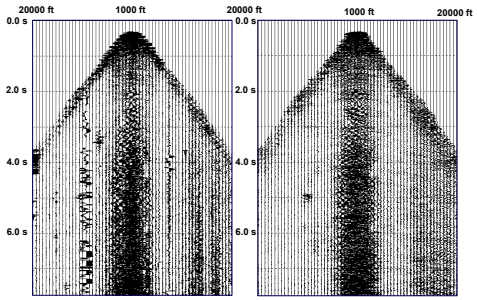


Noise Suppression

Input data: CMP gathers with geometry, decon and residual statics applied



Data courtesy of Fairfield Industries



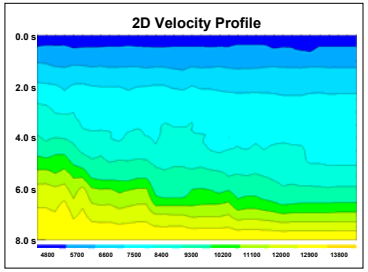
References:

Hilterman, F., Sherwood, J. W. C., Schellhorn, R., Bankhead, B. and DeVault, B., 1998, Identification of lithology in the Gulf of Mexico: The Leading Edge, **17**, no. 02, 215-222.

Thomsen, Leon, 1986, Weak elastic anisotropy: Geophysics, **51**, 1954-1966.

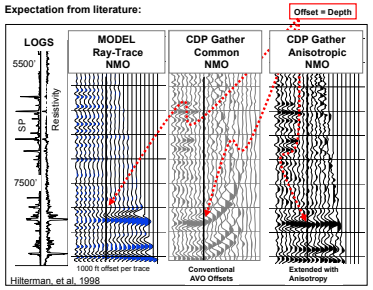
Tsvankin, Ilya and Thomsen, Leon, 1994, Nonhyperbolic reflection moveout in anisotropic media: Geophysics, **59**, 1290-1304.

2D Velocity Profile



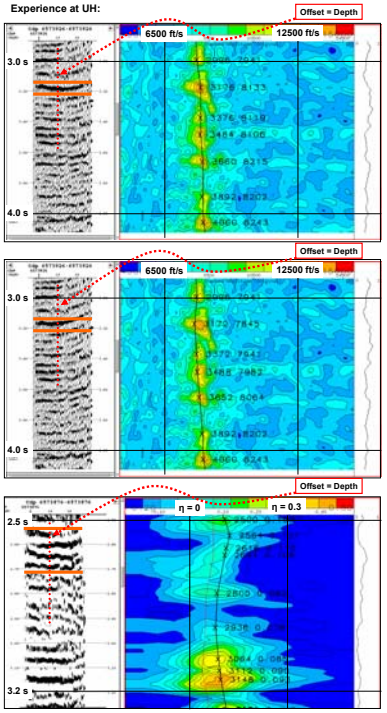
Velocity Analysis

Expectation from literature:

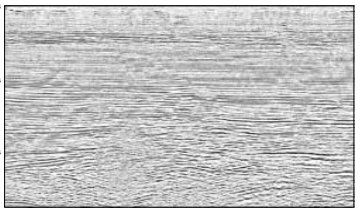


Hilterman, et al, 1998

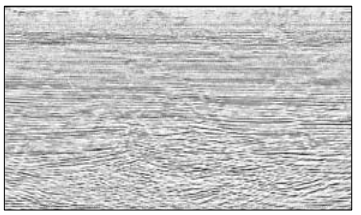
Experience at UH:



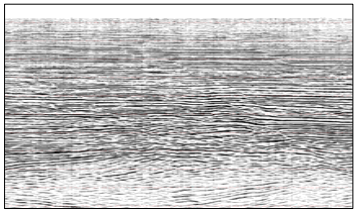
Stack with AGC prestack



2D Poststack Migration of Stack with AGC



3D Prestack Migration



3D Prestack Migration with AGC