GEOPHYSICS POSTER 13

POST-STACK CROSS EQUALIZATION FOR TIME-LAPSE SEISMIC

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Successful 4D imaging requires high repeatability. Repeatability is a measure of similarity of two or more vintages of seismic data and is a function of acquisition geometry, ambient conditions and processing similarity. This paper illustrates a case study to cross equalize two 3D datasets acquired in 1995 (base) and 2006 (monitor) in a field with pressure maintenance support to analyze whether technology can be used for reservoir monitoring purposes.

Prior to the cross equalization effort, the base and monitor surveys were processed together using a 4D co-processing workflow. Co-processing is done with careful choice of parameters to maximize repeatability and optimize production-related 4D responses. The cross-equalization process is done after co-processing to minimize any seismic differences unrelated to production (improving repeatability) and enhancing the interpretability of the real 4D signal. This is also the process that generates the final 4D volumes and 4D attributes for the interpretation analysis.

The key steps in the cross equalization workflow include residual phase matching, static time shift, matching filter, amplitude normalization and time varying time shift. The accuracy of co-processing and consistent acquisition minimized the level of required cross equalization. Appropriate QC at each stage of cross equalization ensures that the desired 4D effect is preserved as the two datasets become increasingly comparable and look alike in the non-reservoir zones where ideally no change is expected. The final differences after cross equalization clearly shows high amplitude 4D anomalies around injector wells.

The overall improvement of 4% repeatability was achieved through the cross equalization process. The 4D data successfully imaged both water and gas movement throughout the major reservoir and results are currently being used to update the geologic and reservoir simulation models as well as to support a drilling campaign.

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