

Exploration Revival from Multi-Vintage Diverse Source Dataset - Bay of Biscay

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Abstract

This case study demonstrates how tailored and methodical processing of multiple vintages of legacy seismic data can generate a new contiguous dataset to re-evaluate frontier areas where no modern seismic exists. The Bay of Biscay has been extensively covered by seismic since the late 1960's, but there has been only limited exploration since 2000 due to environmental restrictions. Reprocessing of this legacy data proved challenging due to the poor quality of the support data supplied, and the variety of seismic acquisition techniques used. Fourteen different surveys, totaling 6200km and acquired using a variety of seismic sources, were selected for this study. Each of the seismic sources used had a specific methodology of analysis and preparation and presented a set of challenges in the imaging sequence based on their different frequency spectra and phase. Each was processed as similarly as possible and potential different responses to each step were reviewed by checking frequency phase at regular intervals. Using standard methods, the data for each source type was zero phased and then processed following a modern PSTM imaging sequence. Final phase matching was performed post stack, giving a contiguous dataset consisting of multiple vintages suitable for regional interpretation that is available previously in this frontier basin. The re-processed data has significantly enhanced the quality and interpretability of the data throughout the section, which in turn has identified many geological features with potential hydrocarbon interest. Better imaging of continuous reflectors and structural geometries yields improved definition of faults and salt diapirism. Deeper structures are better resolved giving a more comprehensive understanding of the basin's geological evolution and history as well as prospectivity of the area at source rock level. In conclusion, applying modern processing and imaging workflows to data acquired decades ago has significantly enhanced its quality and interpretability. However, these improvements require a meticulous approach, in this case understanding the historical evolution of seismic sources and associated processing solutions. In the Bay of Biscay this approach has revealed new insights into the structures, plays and exciting hydrocarbon potential of this basin.