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Subsalt Imaging of the Perdido Foldbelt in the Deepwater Gulf of Mexico

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The Perdido Foldbelt is located in the southern half of the Alaminos Canyon area in the deepwater Gulf of Mexico and consists of a series of NE-SW trending folds that extend south into Mexican waters and north beneath the salt canopy. Several recent hydrocarbon discoveries along the Perdido foldbelt have increased the exploration activities in the area. The remaining potential now lies in the subsalt portion of the trend where seismic images are poor. The ability to image subsalt folds is crucial to future exploration success along the Perdido foldbelt.

Similar to other subsalt regions in the deepwater Gulf of Mexico, the main causes for poor data in the Perdido foldbelt are wave field distortion due to irregular salt bodies and strong multiple contamination. An initial attempt to improve subsalt images consisted of using iterative Kirchhoff prestack depth migration for imaging and high-resolution Radon for multiple attenuation. The resulting images are superior to those from time-domain processing. However, the subsalt regions are still not well imaged, particularly underneath irregular salt bodies. Further attempts were made to improve the migrated images using a migration method based on wave field extrapolation. In addition, 3D SRME was applied to more effectively suppress multiples, particularly out-of-the-plane multiples caused by the seabed and the rugose top of the salt layer. As a result, improved subsalt images were obtained in most of the areas.

The lessons learned from the experiments were two fold. First, processing technology is continually evolving. Even though an individual technique often only produces an incremental improvement, the combining of several new technologies, such as wavefield migration and 3D SRME, are able to achieve significant improvements. Second, subsalt imaging remains a challenging task. Additional advances in velocity estimation, salt interpretation and data acquisition technology are needed to further improve subsalt images along the Perdido foldbelt.