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3D Structural Balancing and Visualisation in the Sub-Andean Fold and Thrust Belt, Peru

Hydrocarbon exploration in onshore frontier basins is often based on 2D seismic data of variable vintage and quality. Building and balancing a 3D model from these types of data can contribute greatly to exploration success. Two sets of regional 2D seismic data from the Camisea region in the Peruvian Andes are the basis of an integrated 2D and 3D model. Well and surface data also provided constraints for the 3D modeling.

After depth conversion we reinterpreted and balanced all the existing seismic lines in 2D. The lines spacing varies from approximately 2 to 10 km. To understand the structural evolution in 3D, and to structurally validate the interpretation in 3D, we built a 3D model of the region from the balanced seismic lines, map and well data. The 3D model covers approximately 15,000km^2.

In order to validate the 3D model we restored and balanced the 3D model in map-view. This balancing test highlighted lack of consistency in the 2D sections, which had individually met balancing constraints in 2D. Only by balancing a 3D model could we fully assess the trap geometry, sequence of deformation, fault linkages, fault terminations and define the pre-deformation basin geometry. The resulting structurally valid 3D model, created from the 2D data, provides a basis for ongoing basin modeling and structural analysis. 3D balancing is a key step in constraining and understanding risk in frontier exploration.