Abstract

Aerogravimetric data calibrated with well and 2D seismic reflection data were used to model the geometry of the Garzón basement thrust fault and the top of crystalline basement in the Upper Magdalena Valley, Colombia. The Regional Gravity Field was estimated from the profile to the northwest of the Garzón fault, where the sedimentary section is well imaged seismically and constrained by the Gigante-1 well. The regional model is consistent with results from the unmigrated seismic line and west-northwest-southeast shallowing of the dense lower crust and mantle to the southeast under the Garzón Massif.

METHOD

Velocity-Depth Model. An initial depth model was derived from well logs, the unigrated seismic reflection profile, and the down-hole velocity survey. The model included depths to the Garzón fault, the top of Simonella Fm, and the top of Saldaña Formation (basement). The initial model correlates well with the migrated seismic profile. However, the dip of the Garzón fault is ambiguous to the southeast under the Garzón Massif.

Gravity Map. Aerogravimetric data was used to produce a Bouguer Anomaly Map and input to Geosoft Oasis Montaj gravity modeling software. Observed gravity was then extracted from the data along the profile line.

Rock Densities. The gravity anomaly was calibrated with well data and sediment velocities, and formation rock types.

Regional Gravity Field. The regional gravity field was estimated from the profile to the northwest of the Garzón fault, where the sedimentary section is well imaged seismically and constrained by the Gilgante-1 well. The regional model was derived from the unmigrated seismic line and west-northwest-southeast shallowing of the dense lower crust and mantle to the southeast under the Garzón Massif.

2-D Density Models. 2-dimensional forward models were then constructed with average well densities, seismic velocities, and rock types, and the initial depth model from well data and seismic data northwest of the Garzón fault. The calculated model density fits the observed gravity well in the northwest, but the model density is ambiguous to the southeast under the Garzón Massif.

CONCLUSIONS AND RECOMMENDATIONS

This study successfully used aerogravimetric data calibrated with well data and 2D seismic data to model the geometry of the Garzón fault and the top of basement (Saldaña Formation) in 2 dimensions. The products provide Emerald with an accurate estimate of the position of the Garzón fault zone that is independent of seismic reflection velocity models.

A 3D gravity and magnetic interpretation is recommended to confirm the location of the Garzón fault plane in 3D space as well as exploration targets interpreted from the 2D seismic program.