Paradigm®

Customer Insight

Improved Imaging under an Overthrust System in Onshore Egypt

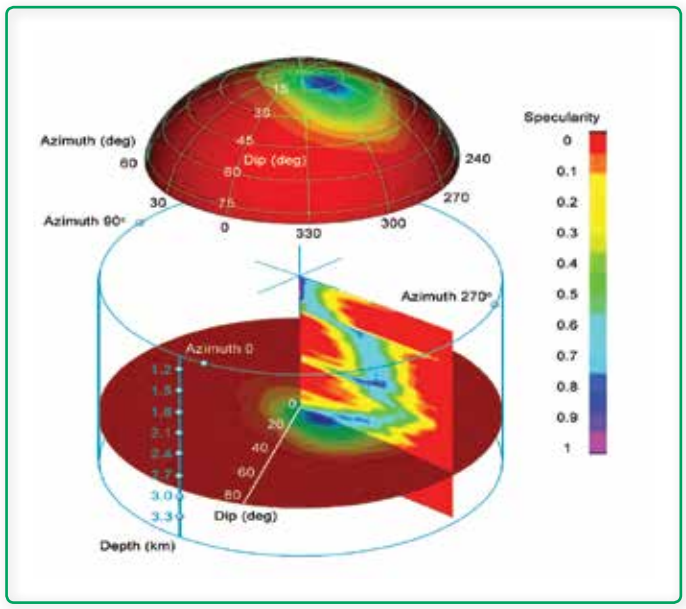
The Challenge

In this case, the subsurface model was characterized by dominant overthrust. The diffraction energy generated by model discontinuities along the overthrust fault masked the image in the vicinity and created an environment in which conventional migrations were unable to clearly image the target area.

The Solution

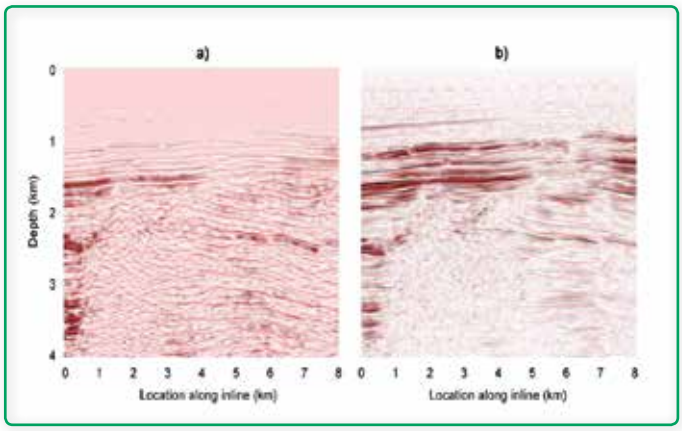
The EarthStudy 360® system has the unique ability to separate out the specular energy containing information about the continuity of coherent events, by creating 3D continuous, full-azimuth directional angle gathers. It then performs specular energy weighting imaging in order to enhance the continuity of the subsurface structure.

The figure to the right shows a "specularity" cylindrical directional angle gather. The high amplitudes of the specular energy along the vertical axis indicate the directivity changes of the subsurface reflectors with depth.

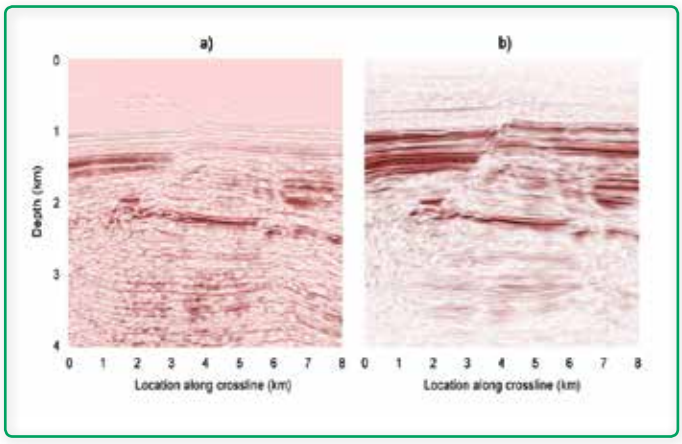


"Specularity" cylindrical directional angle gather

The figures below show the different imaging results when using traditional Kirchhoff-based migrations, and when using the specular energy separated by the EarthStudy 360 system. The lefthand figures show the imaging results of the inline and crossline sections using traditional Kirchhoff-based migrations. The figures on the right show the markedly improved results obtained when using the specular energy shown above as the directional weighted stack operator.



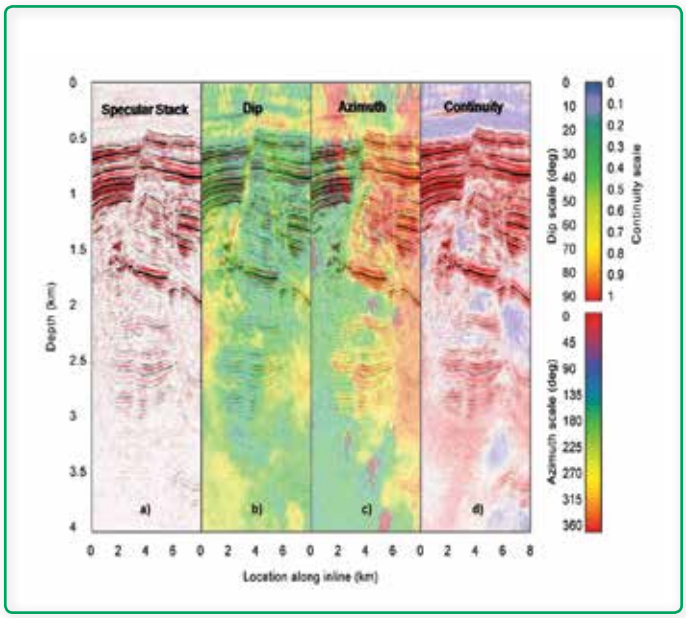
Location along inline (km)



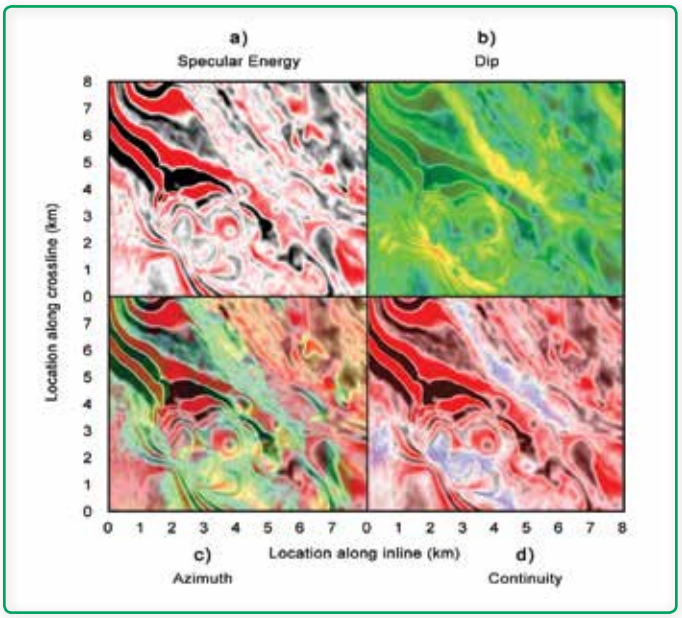
Location along crossline (km)

Each data point in the specularity gather is a measure of the energy concentration computed along the directional angle gather, with a given three-dimensional window: Dip, azimuth and depth.

The lefthand figure below shows the specular weighted energy stack at a given line, and the same image with an overlay of the extracted structural attributes - dip, azimuth, and continuity. The figure on the right shows these attributes for the entire volume at a given depth.



Specular weighted energy stack at a given line, and with an overlay of dip, azimuth, and continuity.



Depth slice throughout 3D image: Specular weighted energy stack, and with an overlay of dip, azimuth, and continuity.

The Results

Use of specular energy as the directional weighed stack operator resulted in markedly improved imaging quality, especially in the vicinity of the overthrust area.

For further information, contact your account representative or visit www.pdgm.com.