Anisotropic depth imaging success

Matthew Lamont

DownUnder GeoSolutions (Dugeo) was fortunate to get awarded a S.E. Asian reprocessing project late in 2011. The survey was shot in an area with a very rugose sea floor and extremely complex geology. The data had been acquired and processed in 2011 by one of the 'major' acquisition & processing houses. Their on-shore processing used an array of their latest technologies. Unfortunately the results were poor and the client immediately embarked on a reprocessing project.

DownUnder GeoSolutions had the benefit of seeing the previous results and the workflow used to produce them. We felt that there were two main issues: noise contamination and imaging. Clearly doing better on the noise removal would reap great rewards during model building as well as produce a superior final image.

We used our award-winning Linear Noise Removal and 3D true azimuth SRME to address the noise issues. The previous processing used an FK velocity filter and 2D SRME. In areas with rugose sea floors and complex geometries below the sea floor, 3D true azimuth SRME produces data with significantly less multiples as well as superior preservation of primary energy. There are very few projects which don't benefit significantly from a True Azimuth 3D SRME.

On the imaging front, both companies felt that a TTI anisotropic workflow and algorithms would be key in an area with such complex and strong dips.

Conclusion

Significant improvements were made at all levels by DownUnder GeoSolutions' processing. This enabled the client to make considerable strides forward with their interpretation.

We would like to thank our client for permission to publish. They wish to remain anonymous.

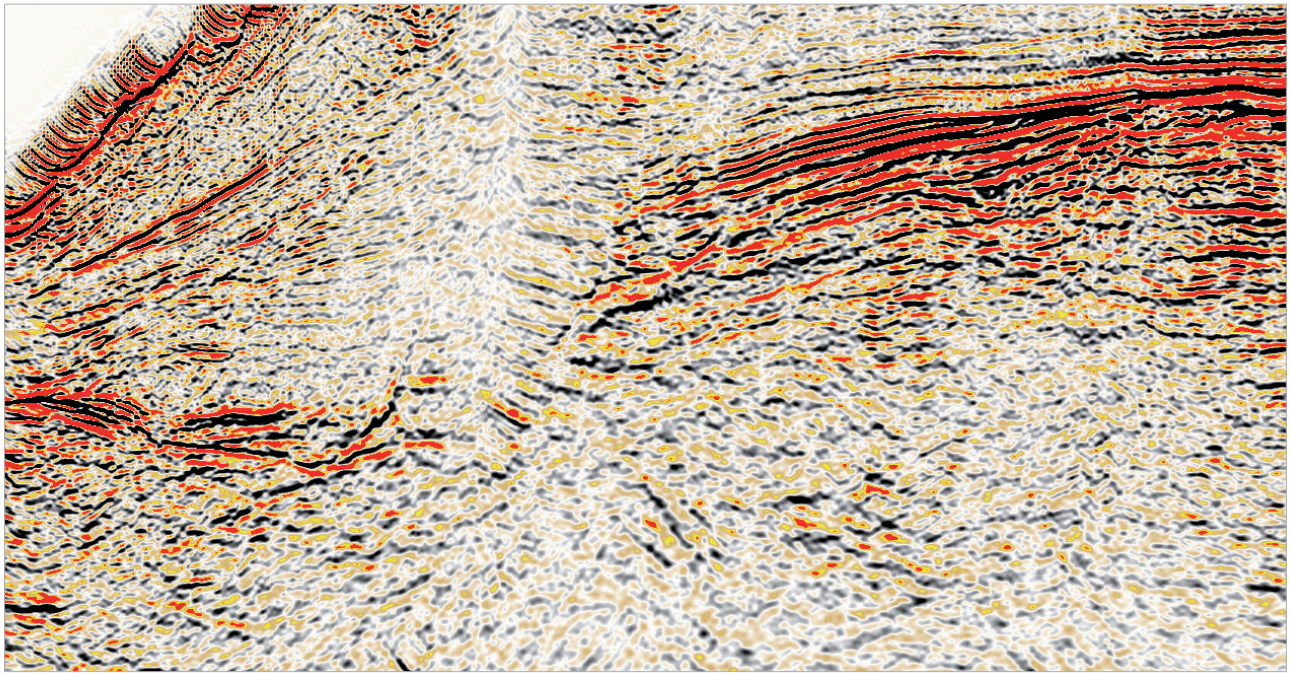
The processing highlights of each approach were:

2011 'major contractor' processing highlights
2D SRME
Backus tau-p deconvolution
FK velocity filter
3D interpolation and regularization
Seven iterations of tomographic PreSDM model building
Full Volume Beam PreSDM: • Able to handle steep and overturned dips • The ability to reject noise • Incorporation of anisotropy • Multi-pathing algorithm
3DRNMO
Q compensation

2011/12 Dugeo reprocessing highlights
Advanced Linear Noise Removal
3D true azimuth SRME
DUGREG, data regularization
Four iterations of tomographic TTI PreSDM model building
Full Volume Kirchhoff PreSDM: • True relative amplitude • Turning rays for steep dips • TTI anisotropy

The following pictures show the final results.

Major contractor processing result



Dugeo reprocessing result

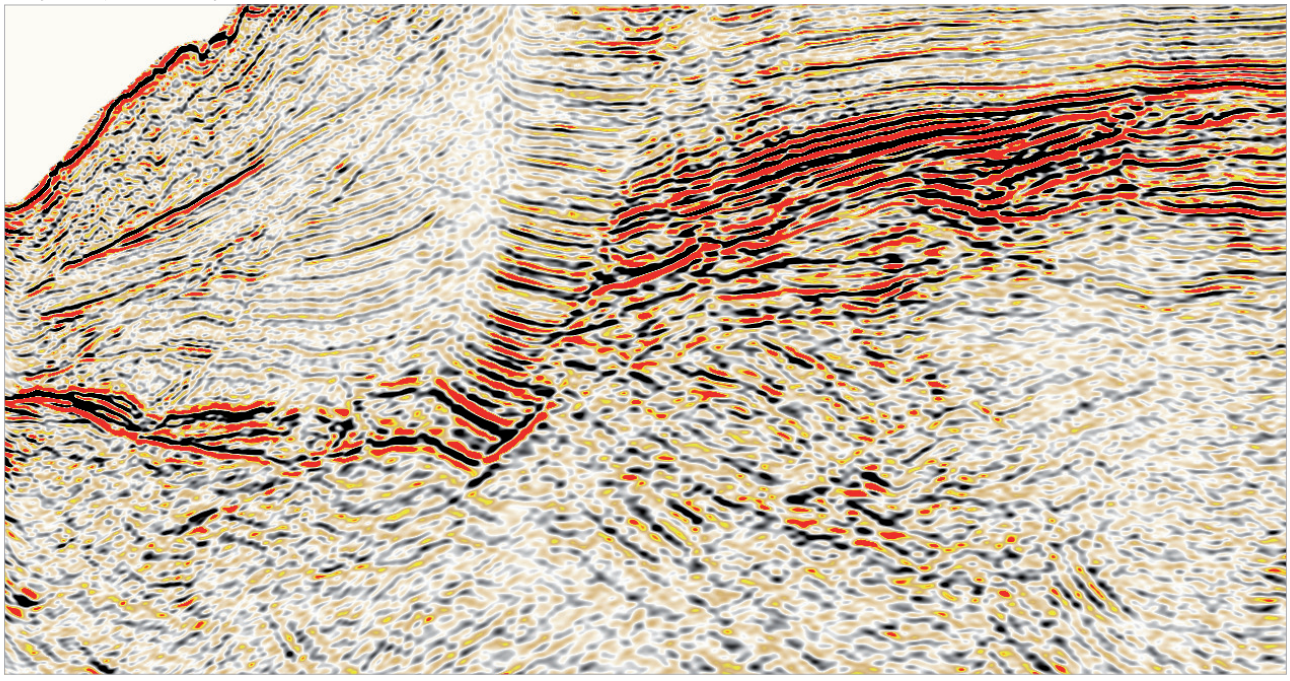
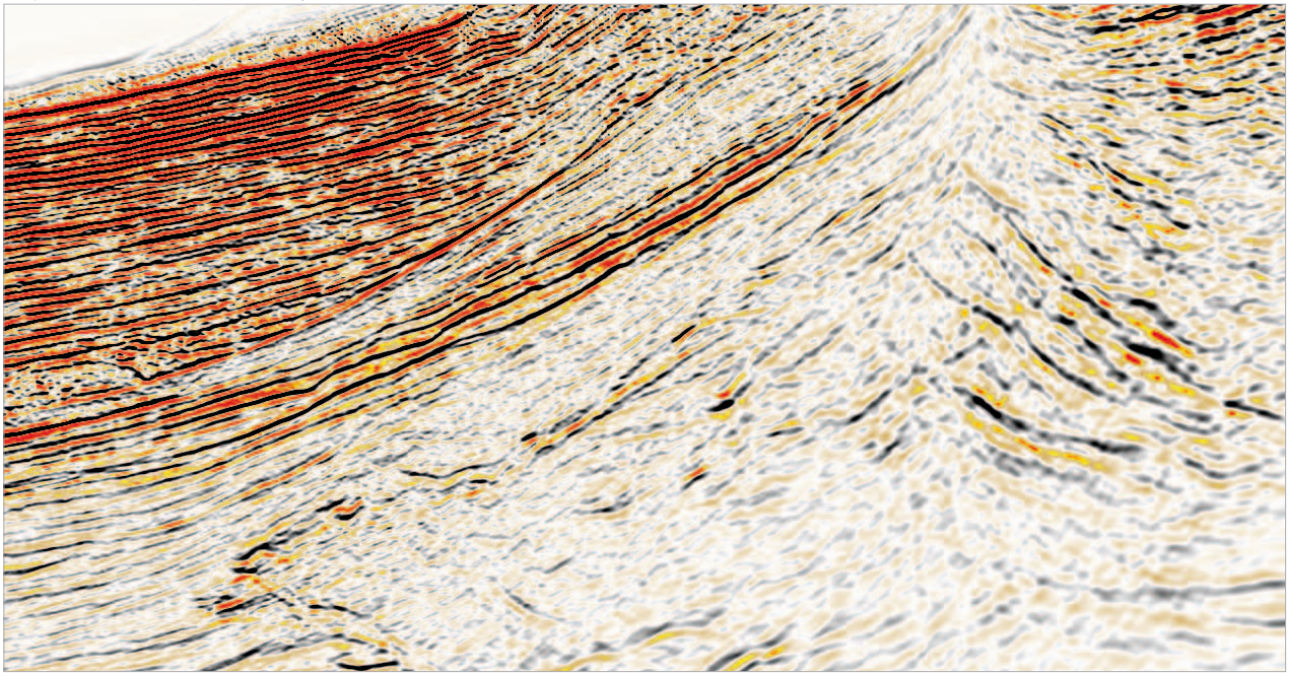


Figure 1
Better imaging is evident throughout the section. The dipping events from the centre to the bottom right of the section are particularly important.

Major contractor processing result



Dugeo reprocessing result

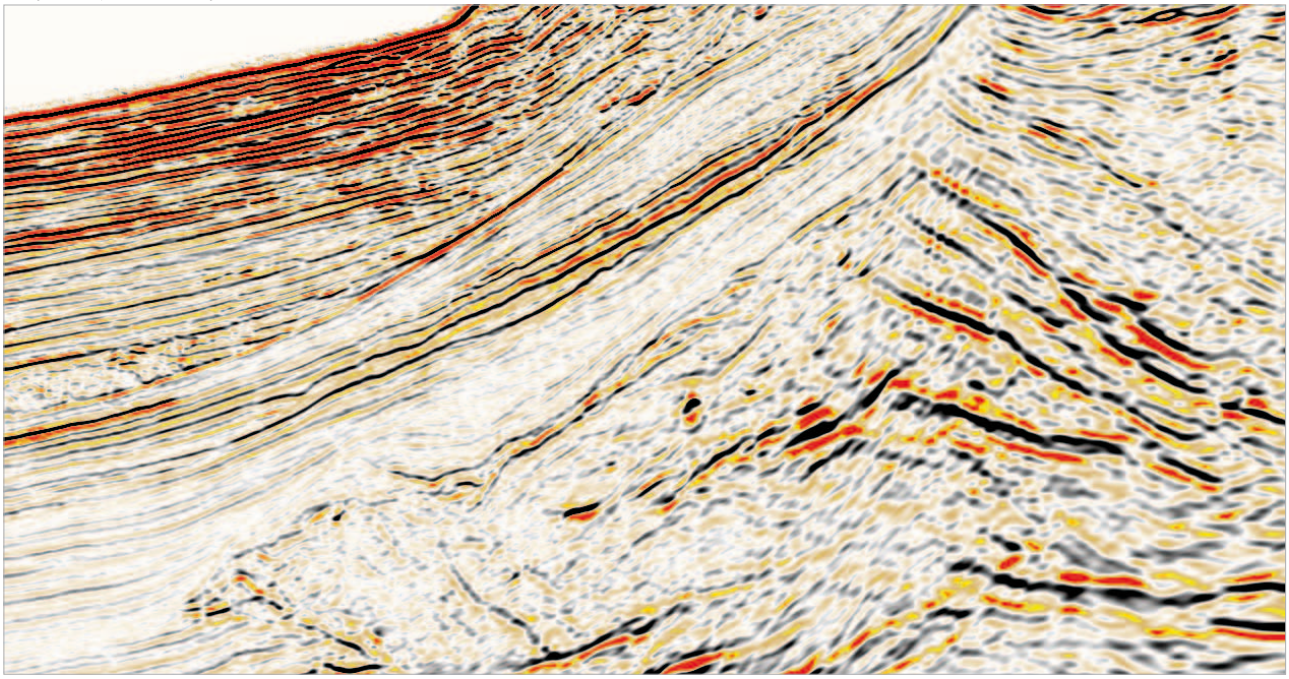
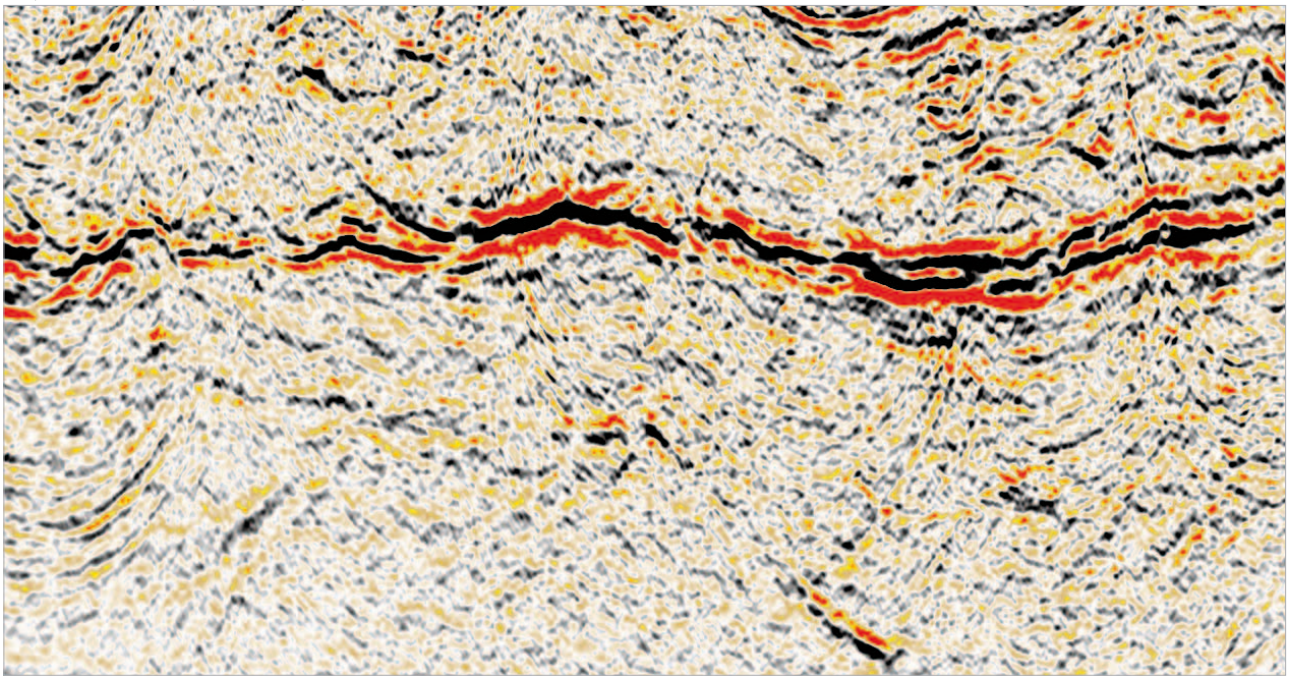


Figure 2
While the initial processing tends to be somewhat 'bland' in character, DownUnder GeoSolutions' reprocessing displays more detailed and subtle variability leading to accurate stratigraphic interpretation.

Major contractor processing result



Dugeo reprocessing result

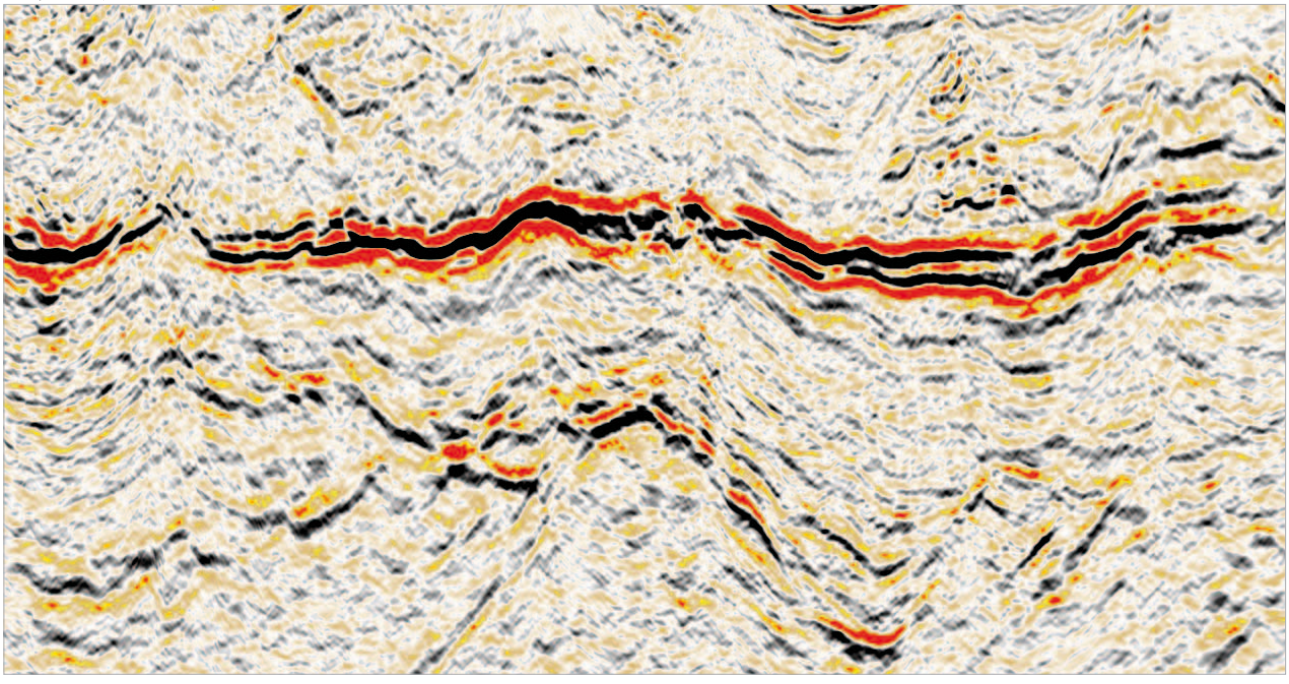
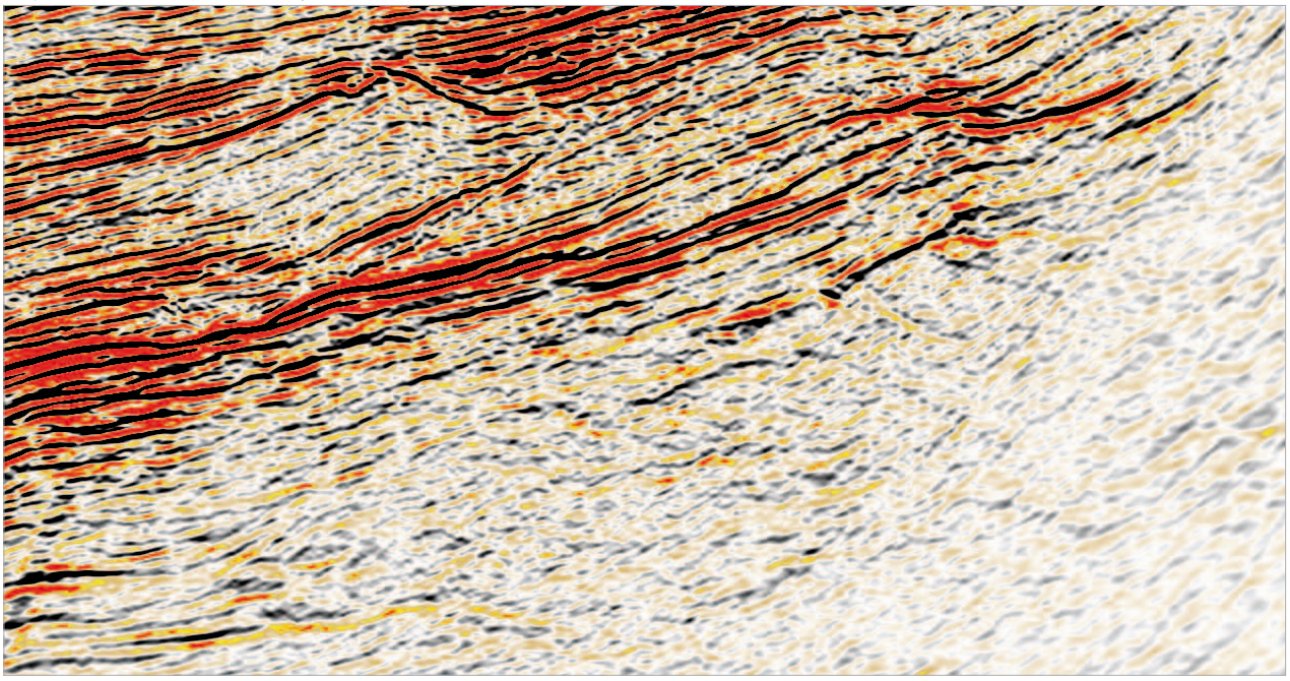


Figure 3
Deep structures can now be mapped.

Major contractor processing result



Dugeo reprocessing result

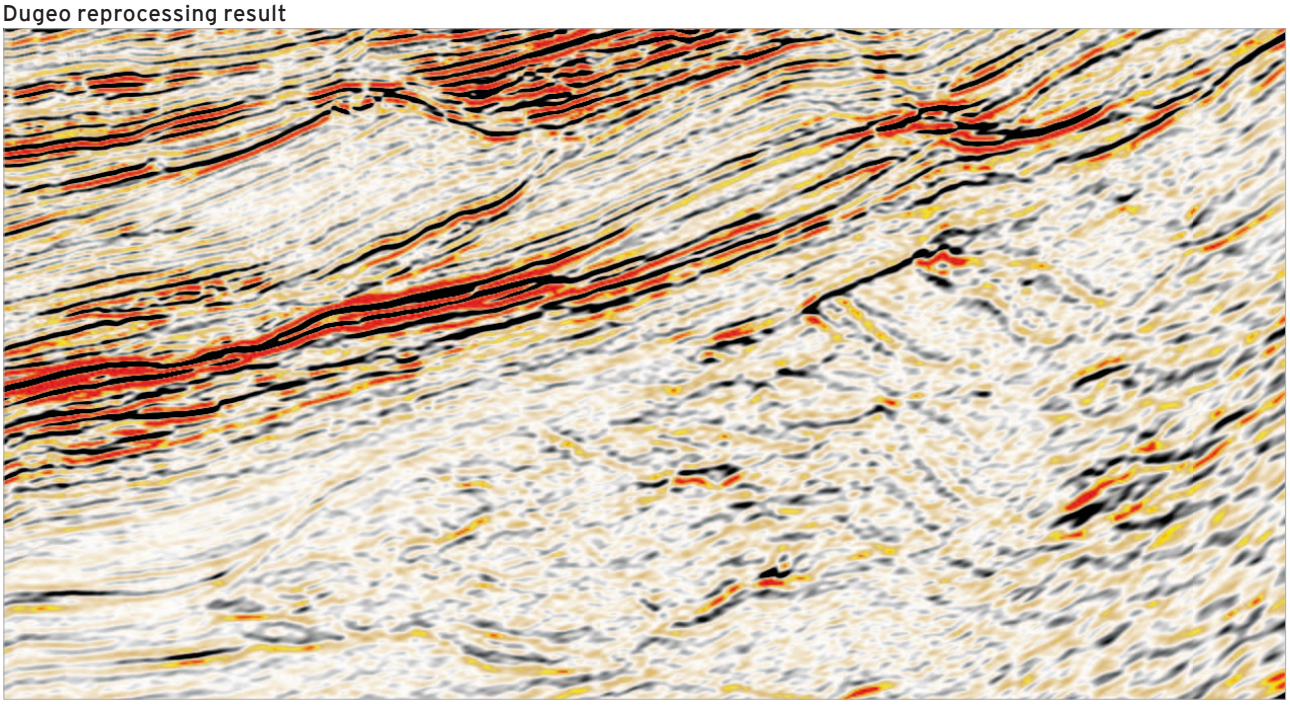


Figure 4
Potential accumulations at the top of dipping events are now evident.