

Depth Imaging in the Delaware Basin – a case study

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Summary

TGS has recently acquired several 3D data-sets in the Delaware (Permian) basin which were processed in Calgary. Pre-processing was challenging due to the noise content typically encountered in the area and the near surface complexity with collapse and dissolution zones in the shallow salt layers.

To obtain viable long wavelength refraction statics solutions in the presence of severe first break 'shingling' secondary events had to be incorporated causing a thickening of the near surface weathering layer used for statics modeling. The structural complexity increases from the center of the basin to the edges where large reverse faulting with displacement of up to 8000 ft can be encountered.

The combination of near surface variability and structural complexity at the basin edges, together with the rapidly changing velocity trends, makes depth migration the preferred imaging tool.

Depth imaging workflows had to be adjusted to include the correct treatment of statics from time imaging, azimuthal tomography to resolve near surface variability, and extensive use of well information and geological interpretations to constrain velocity and anisotropy models.

TTI depth imaging provided a significant uplift over the PSTM image in terms of structural interpretation, velocity modeling, and well ties. An example is shown in Figure 1 below. Key aspects of the workflow with data examples from different 3D data-sets from the Delaware basin are discussed in this presentation.

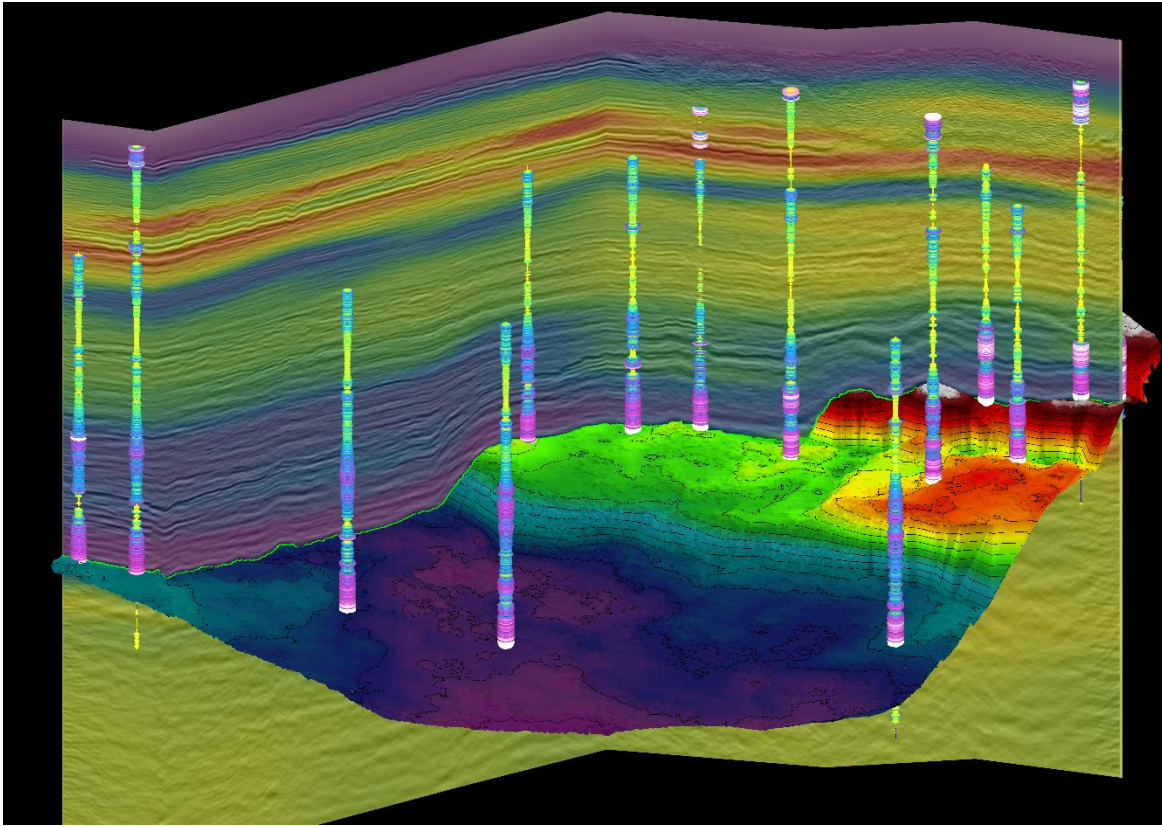


Figure 1: Final depth migrated section, overlaid with the final depth velocity model, and Mississippian horizon slice passing through some of the wells in the area, taken from the West Kermit 3D (data courtesy of TGS).