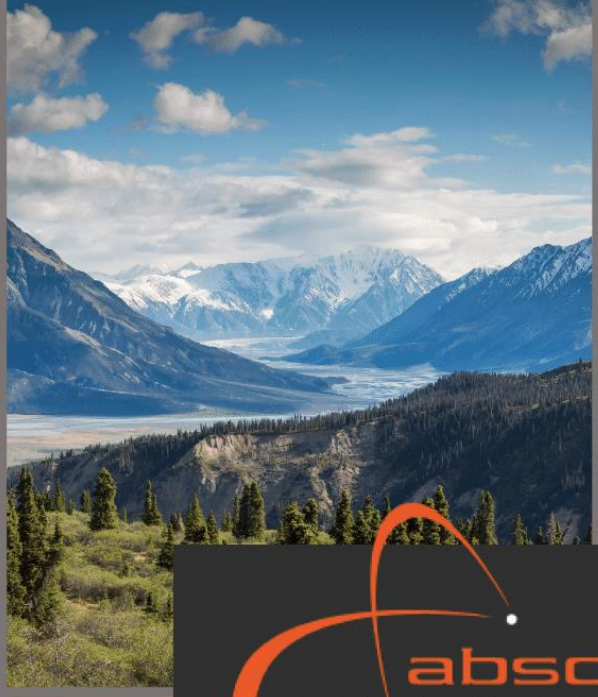

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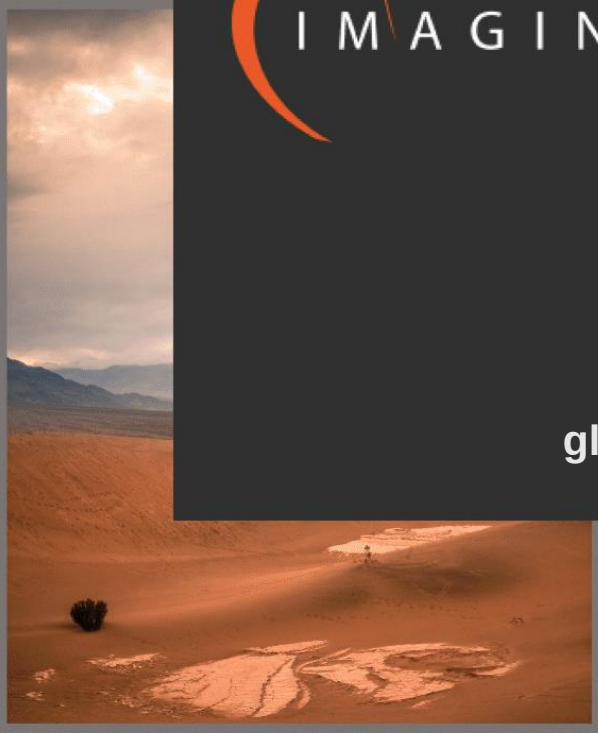

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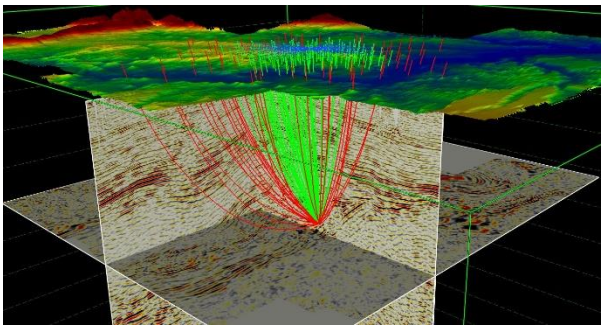
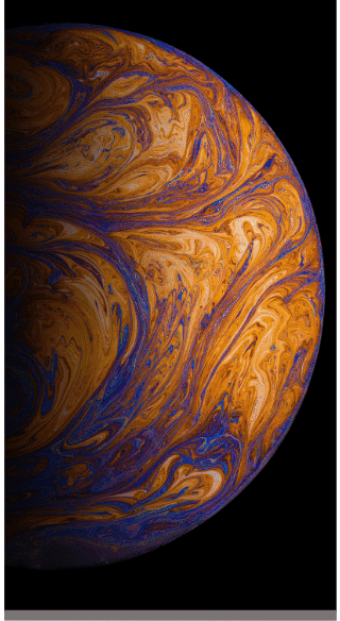
Diffraction imaging analysis provides improved fault geometry interpretation, better understanding of the fault seal, reservoir scale fault compartmentalization and permeability, reservoir fluid flow, etc.

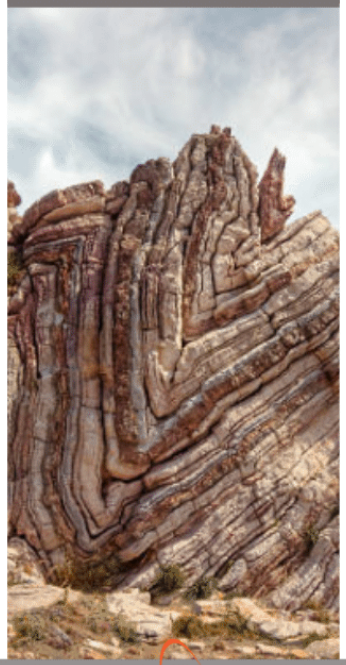
Standard processing workflows are suitable to image larger subsurface geological features and faults. In standard processing human eyes are focused on continuous reflections but not on details within layers. Small scale discontinuities that cause diffractions on seismic records are lost during standard processing in favor of continuous reflectors.



This diffracted energy is of great importance and is lost in stacking processes that are applied in standard seismic processing and imaging procedures. Diffracted energy carries high resolution information of small-scale discontinuities and subsurface geological features, such as isolated scatters and reflector edges, which are often of high interest in seismic interpretation. After diffraction imaging processing, faults with small displacements are revealed on the seismic, allowing interpreters to conduct fault analysis in greater detail.

The main challenge for generating diffraction images is that diffraction energy is usually much weaker than, and often overwhelmed by, the reflection.

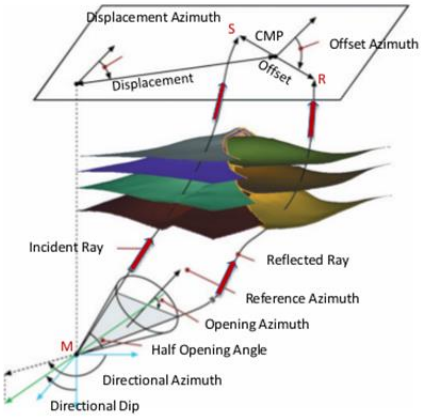


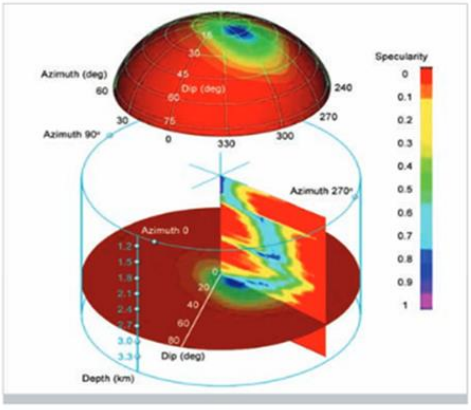


At Absolute Imaging, our Advanced Imaging technology has the ability to 5D decompose recorded data and separate the wavefield into specular/reflection and diffraction energy. Decomposition is conducted prior to integration or stacking so that the lower energy associated with subsurface diffractions can be isolated and subsequently enhanced. Imaging of diffraction energy is enabled by a rich multi dimensional decomposition defined by generating full-azimuth directional gathers.

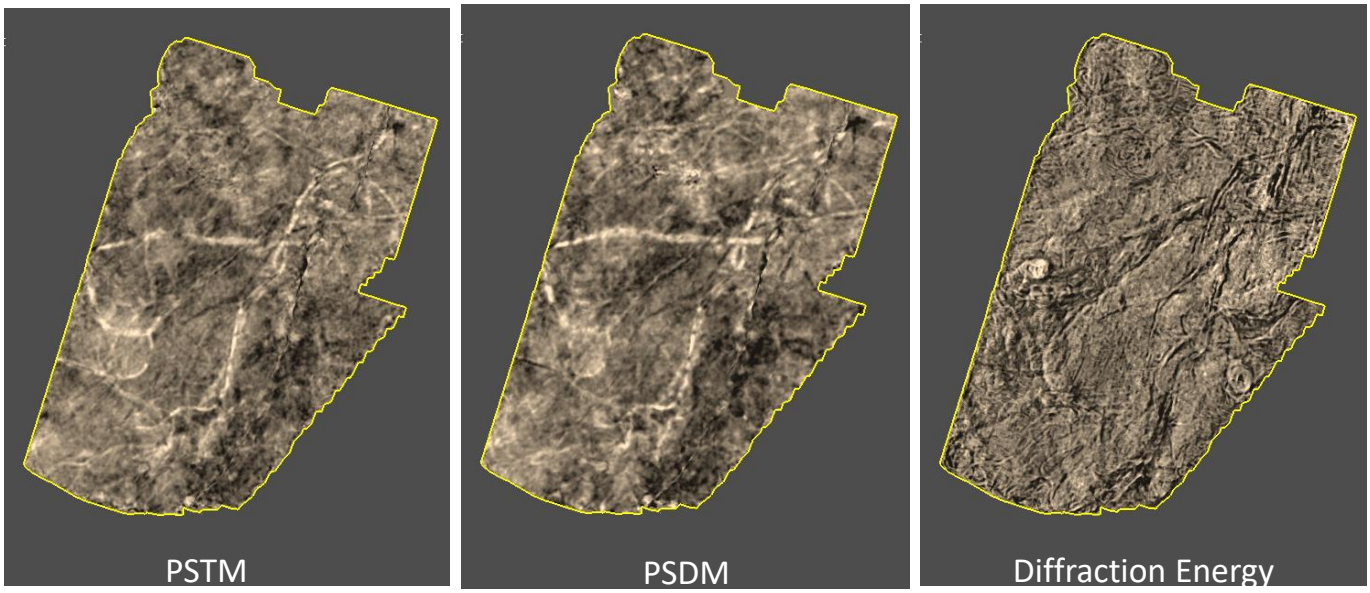
For each imaging point in the subsurface, 5D decomposition is conducted in the Local Angle Domain that includes structural dip and full 360-degree azimuth. By performing this process in the full azimuth local-angle domain, energy associated with high-resolution diffraction events is preserved. 5D decomposition is carried out with a point diffraction ray-tracing operator that shoots rays from the imaging point equally in all directions.

These decomposed wavefields form Directional Gathers that are not typical depth angle gathers. They retain structure dip angle and high resolution continuous 0–360-degree azimuthal information. These gathers carry very detailed azimuthal resolution. After application of a weighting filter on the Directional Gathers, we are able to create two new depth migration stack types – Specular Weighted Stack and Diffraction Weighted Stack.

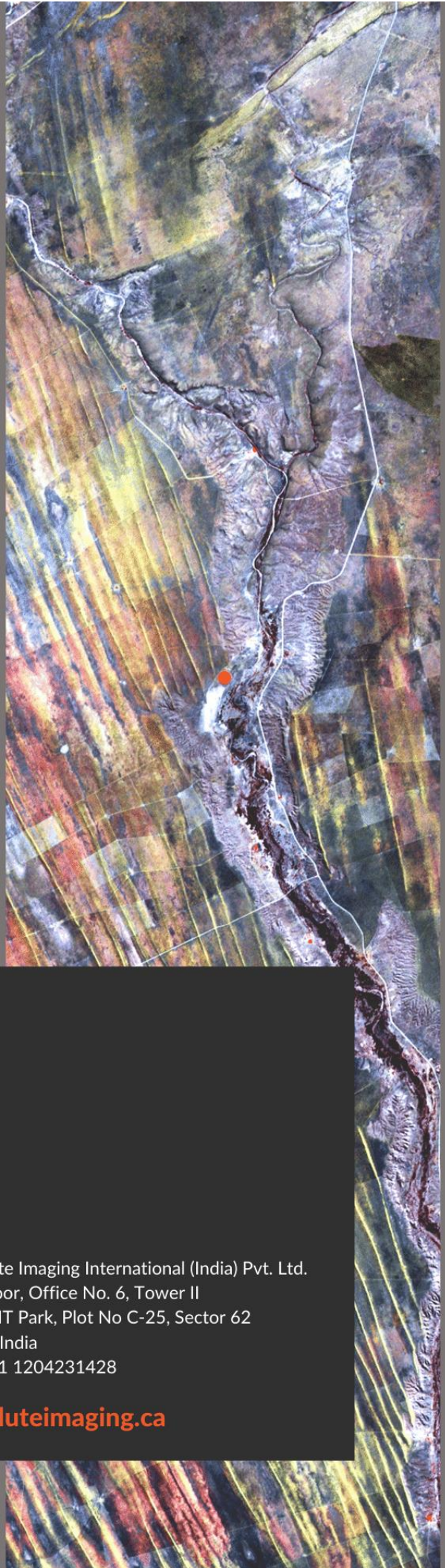




Specular Weighted Stack provides the most continuous image, while retaining crisp faulting used to emphasize and interpret major continuous events and major discontinuities. Specular Imaging uses a special Common Reflection Angle Migrator (CRAM) which is an Advanced Beam Migration ideal for imaging beneath salt structures and in overthrust areas, particularly where there is a dependence of velocity with azimuth (anisotropy). Diffraction Weighted Stack can detect reservoir heterogeneities that are completely obscured by standard imaging procedures.



Diffraction Imaging in Depth Domain



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