

# Precision Depthing with Well Marker Mis-tie Tomography



## Geoscience Insights in 30 Days

Paradigm® is committed to providing oil and gas companies with high-quality geoscience services, to help them gain deeper insight into the subsurface and maximize the value of their assets. As part of our offering, we are happy to announce the availability of "Quick Turn" services, for specialized projects where qualified, on-time delivery is critical.

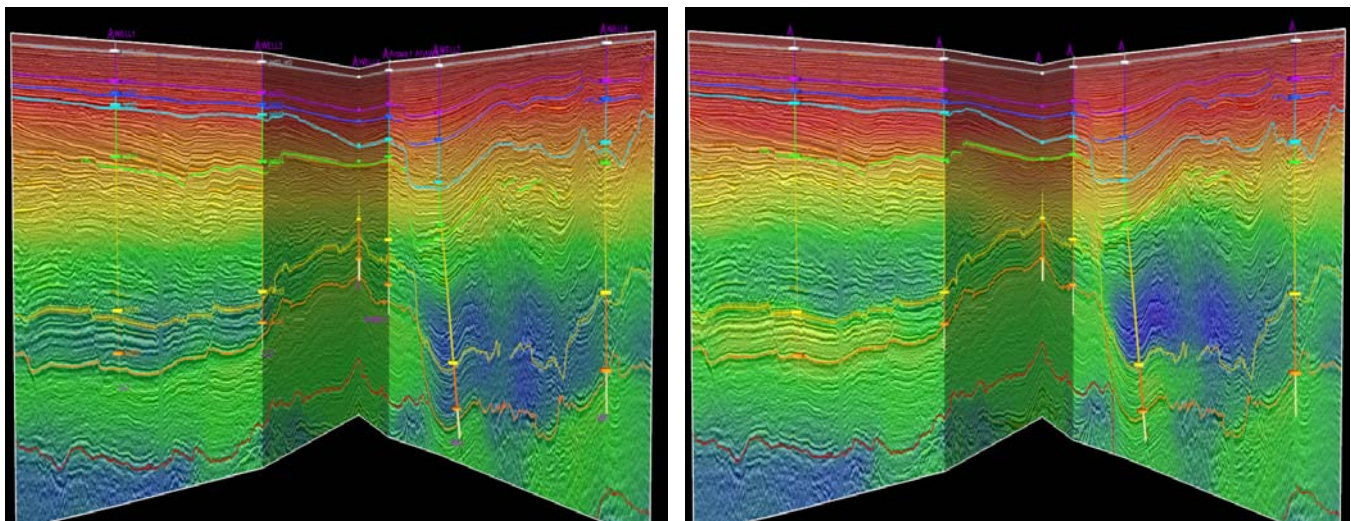
Seismic depthing error can be a significant contributor to mispositioned wells and dry holes. The errors can be sourced to oversimplification of the velocity model parameterization, incorrect parameterization of the velocity model, limitations in seismic resolution, or even the use of bad data. These problems can be created or exacerbated by poorly constrained velocity determination and updating methods.

Seismic interpreters often receive seismic data in time or depth, where well markers and corresponding interpretation horizons exhibit significant mis-ties, without the time or data needed to re-evaluate the velocity model. To solve this problem, Paradigm offers a well marker mis-tie tomography solution to minimize mismatches between well markers and interpreted horizons in depth, while preserving the traveltimes that result in flattened image point gathers.

Well marker mis-tie tomography is a specific case of a more general class of solutions referred to as Time Preserving Tomography (TPT). TPT incorporates constraints on medium parameters and structure from geologic data or well marker data into the global tomography solution. The least squares solution preserves the traveltimes of rays shot through the model, while incorporating the model perturbations as input values. In the case of well marker mis-tie tomography, depth mis-tie grids rather than residual moveout values are inverted. Perturbations of other medium parameters, such as vertical velocity, epsilon, and delta, can also be included (updated) in this solution. The depth mis-ties are treated as "soft constraints" through an additional set of equations that are solved with the original tomography equations.

For poststack operations, tomographic updates are carried out along normal incidence rays, a procedure that can run comfortably on workstations. Performing the ray tracing along normal incidence rays takes into account lateral displacement, as opposed to simple vertical stretching. The solution is structured to handle large numbers of well markers simultaneously.

This well marker mis-tie tomography can be used to convert velocity models from isotropic to anisotropic, or to refine the parameterization of isotropic and anisotropic models.



▲ Seismic data from Taranaki basin before and after well-tie tomography

# Precision Depthing with Well Marker Mis-tie Tomography

## Paradigm Precision Depthing with Well Marker Mis-tie Tomography Advantages

- A global and geophysically-grounded solution for time-to-depth conversion or redepthing
- Designed for isotropic and anisotropic velocity model updates and conversions
- Accommodates lateral displacement with no bulls-eye artifacts around wellbores
- Maintains seismic velocity spatial variation and traveltimes
- Can be run on desktops or clusters in time frames that do not compromise interpretation and modeling deadlines

## This “Quick Turn” Service provides added value to:

- Interpreters working in development fields with large numbers of well markers and corresponding well marker mis-ties, that require a very robust velocity model for time-to-depth or depth-to-depth conversion (e.g. unconventional)
- Interpreters seeking confirmation of their current isotropic or anisotropic velocity models used for time-to-depth conversion
- Interpreters under tight deadlines who do not have time to revisit prestack geophysical operations to correct mis-tie problems

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## About Paradigm Geoscience Services

For over thirty years, Paradigm has been recognized for its industry-leading integrated technology and exceptional people. Our products have played a major role in finding and developing some of the largest oilfields in the world.

Combining our R&D strength and software interoperability with expert implementation, the Paradigm Geoscience Services team collaborates with our clients to provide complete solutions, from seismic and wellbore field data, to prospects, and drilling targets. Whether using proven and field-tested methodologies or new, innovative solutions, our best and brightest geoscientists deliver a highly collaborative, interactive and quality service offering. The advanced technologies offered by our Services group deliver more insights into the subsurface, enabling you to make better informed, timelier and more accurate decisions.

For more information about Paradigm Geoscience Services, please visit our Website: [pdgm.com/gs-services](http://pdgm.com/gs-services).