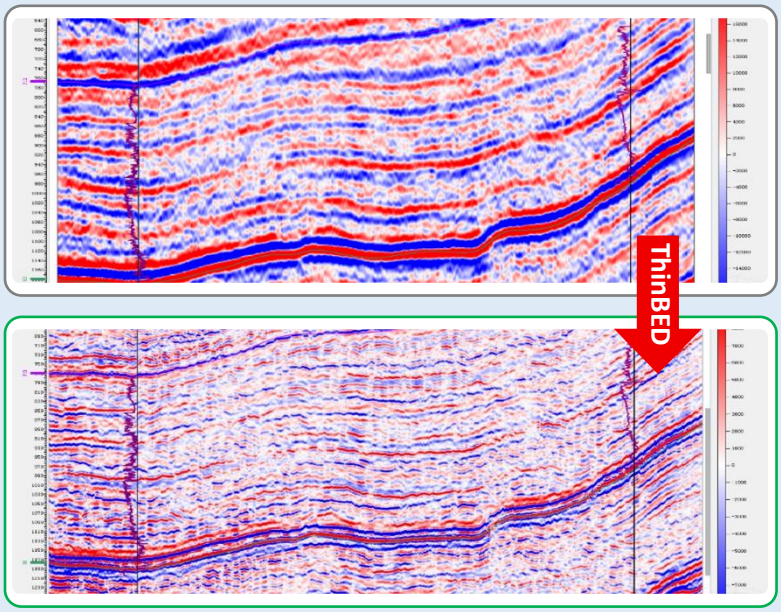
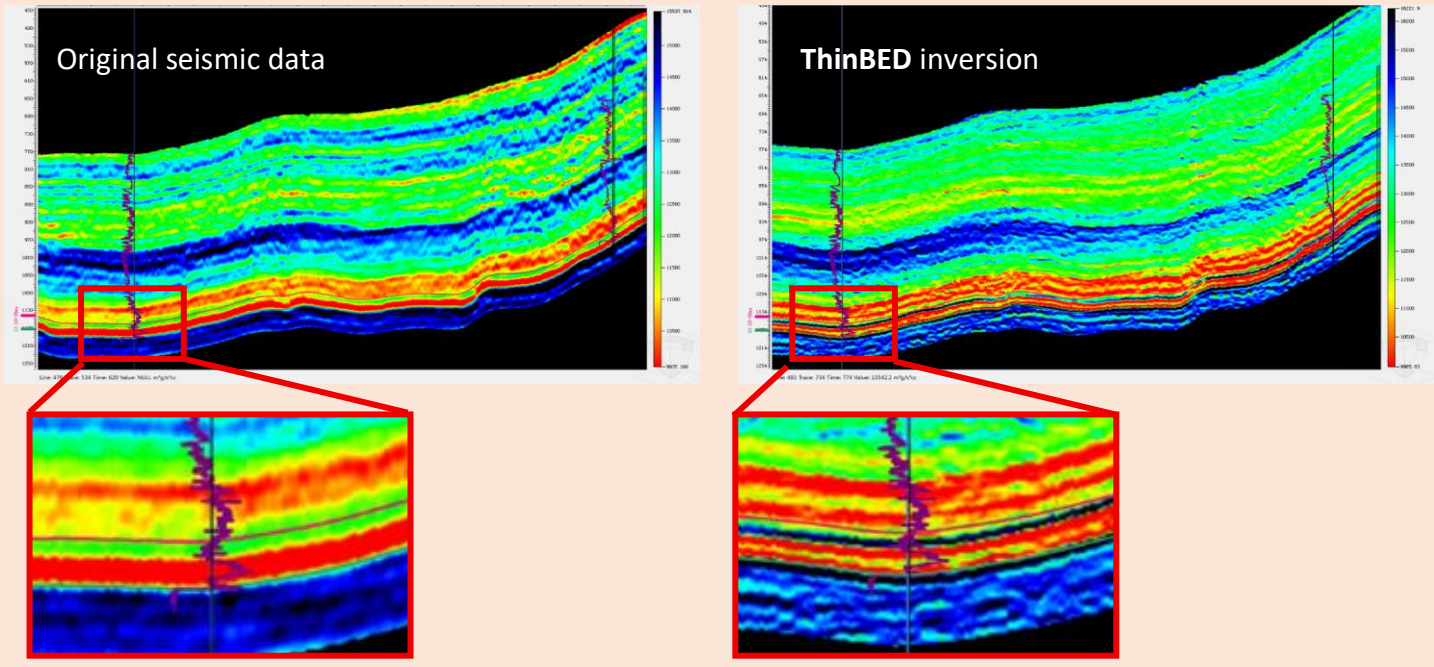
ThinBED

High-Resolution Broadband Seismic Spectral Inversion Software



ThinBED is high-resolution broadband seismic spectral inversion software capable of identifying formations thinner than the tuning thickness.

Geological constraints are embedded into its inversion workflow, significantly boosting formation prediction precision.

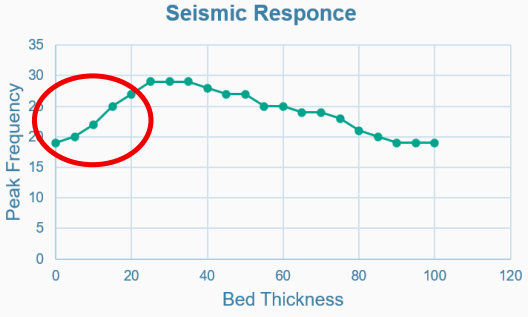


A set of gas shales, with top shale outperforming bottom shale. The two layers of shales can be distinguished by **ThinBED inversion**, but the original seismic data cannot.

Seismic Resolution Paradox

Our long-standing consensus is that the maximum seismic resolution is **1/4 of the wavelength**.

However, experiment indicates that the peak frequency remains **responsive** even for beds **thinner than 20 ft**, which contradicts our established consensus.



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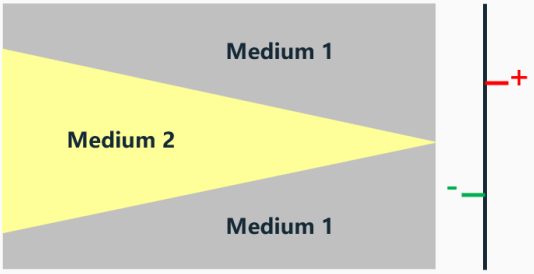
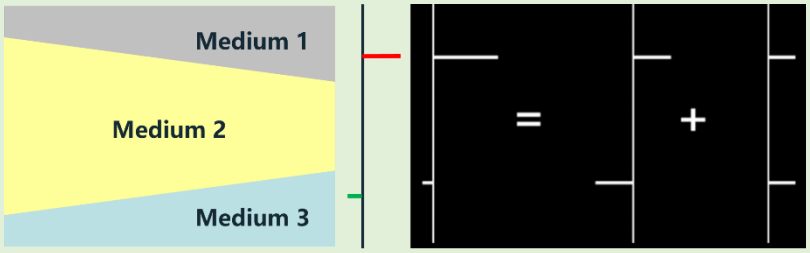
In fact, this consensus originates from Widess' classic paper *How Thin Is a Thin Bed*, wherein a wedge model was adopted to derive the resolution limit of 1/4 of the wavelength.

This Widess wedge model(shown on the right) suffers inherent flaws: a simple wedge in homogeneous host rock creates equal-amplitude, opposite-polarity reflection coefficients at its top and bottom interfaces.



A more realistic model generates pairs of reflection coefficients of arbitrary sizes and polarities at interfaces. These pairs can be decomposed into **even** and **odd** parts:



Any rational function can be split into odd part and even part:

$$f_o(n) = \frac{f(n) - f(-n)}{2}$$

$$f_e(n) = \frac{f(n) + f(-n)}{2}$$

The Widess model excludes the even part, which carries critical high-resolution information, Consequently, seismic resolution limits derived solely from the Widess model are inaccurate.

ThinBED inversion workflow:

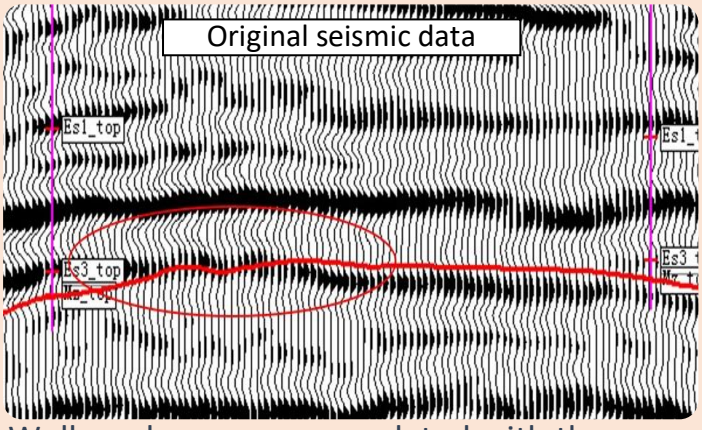
1. Spectral Decomposition
Transform seismic data to time–frequency domain.

2. Wavelet Estimation
Extract W(f) from data or well logs.

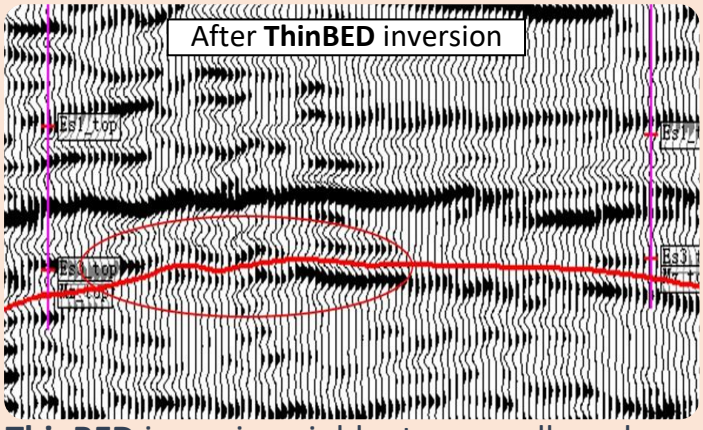
3. Constraint Setup
Define sparsity (L1), smoothness, & priors.

4. Inversion
Minimize misfit to solve for reflectivity R(f).

5. IFFT
Final reflectivity



Well markers are uncorrelated with the seismic horizon in raw seismic data.



ThinBED inversion yields strong well marker–seismic horizon correlation.

We deliver software licensing and customized project services leveraging our core technologies.

Licenses for **ThinBED** are offered in two deployment forms: a standalone application, or an integrated plug-in for **PaleoScan**.

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