

# Juniper Bay Software

Professionally crafted plug-ins for the  
SeisSpace ProMAX seismic processing system

**Juniper Bay Software** develops and leases plug-in tools for Halliburton's SeisSpace® ProMax® seismic processing system. Juniper Bay's current products are:

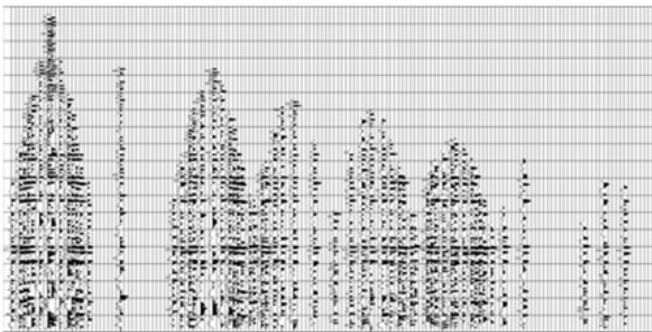
Rank-reduction-based 5D interpolation  
First-break noise removal and picking  
Powerline noise removal  
High-resolution multiple removal

Written and supported by one of the seismic industry's most experienced software developers, every product is well described, well tested, easy to use, highly optimized, and has built-in quality controls. Development is done in collaboration with Absolute Imaging Inc. at their seismic processing center in Calgary, Alberta, providing constant feedback and testing by production processors. Ask for a free trial to enhance your ProMAX processing today!

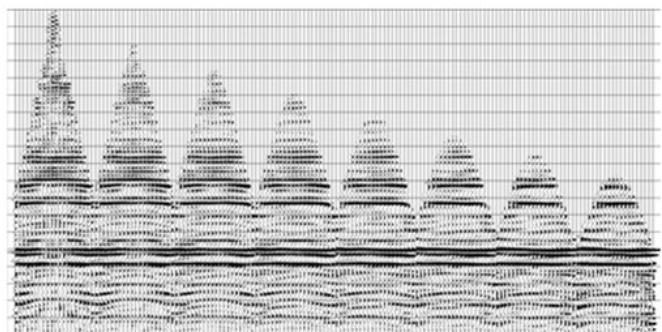
*See our talk at the 2019 SEG convention in San Antonio!*

***Cleaning up first arrivals in the cross-spread domain***  
8:55 AM Wednesday September 18th, room 304B

## ***Rank-Reduction-Based 5D Interpolation***



CMP gather



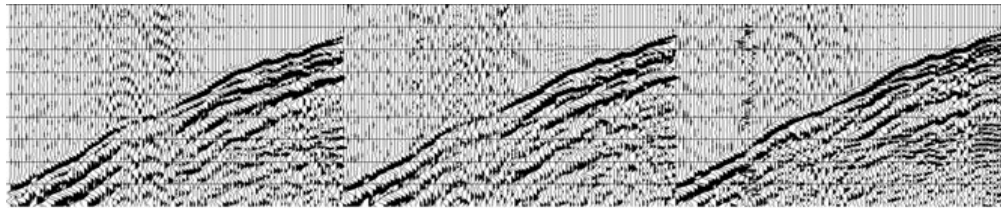
After 5D interpolation

- Based on matrix rank reduction on constant-frequency slices.
- Improves multiple removal, prestack migration, AVA / AVO analysis, and inversion
- Strong random noise attenuator and reduced acquisition footprint.
- More continuous reflectors, particularly up shallow with effective interpolation across small gaps
- Can interpolate multiples, curving events, and diffractions
- Preserves AVO and AVA effects
- Interpolates better than MWNI in regions of low signal-to-noise

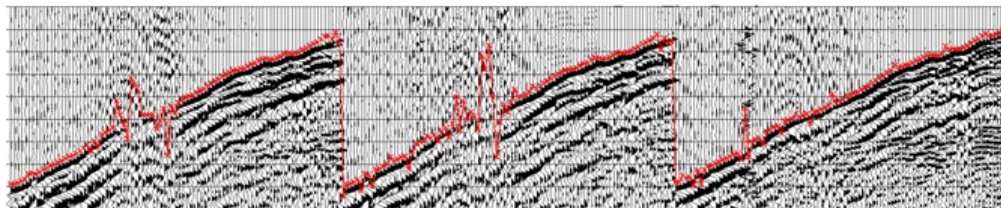
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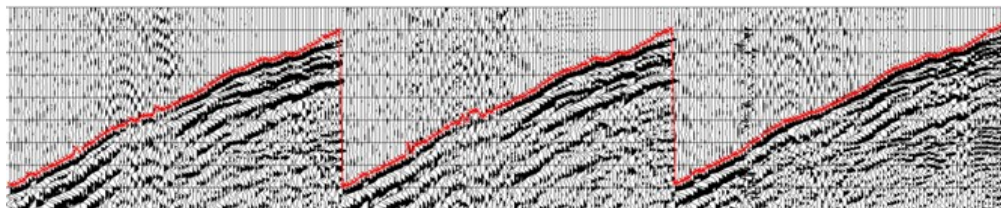
## ***First-Break Noise Removal and Picking***



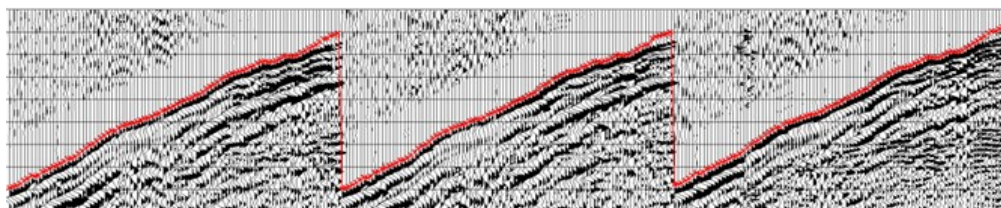
Raw first breaks



Standard picking



Juniper Bay  
picking



Juniper Bay  
noise removal &  
picking

- Juniper Bay's unique solution exploits the "locally surface-consistent" property of cross spreads and the power of robust statistics.
- Works on cross-spread ensembles. Source and receiver lines need not be orthogonal, so parallel-line, slant, 2D, and swath surveys can all be handled.
- Removes random noise, and coherent noise when it's not surface-consistent.
- Preserves short-wavelength statics. Handles (but does not correct for) reverse-polarity traces.
- Does not alter those first breaks that are already clean.
- Has a quality-control mode that shows the flattened first breaks, the cleaned first breaks, and the difference, all in one trace.

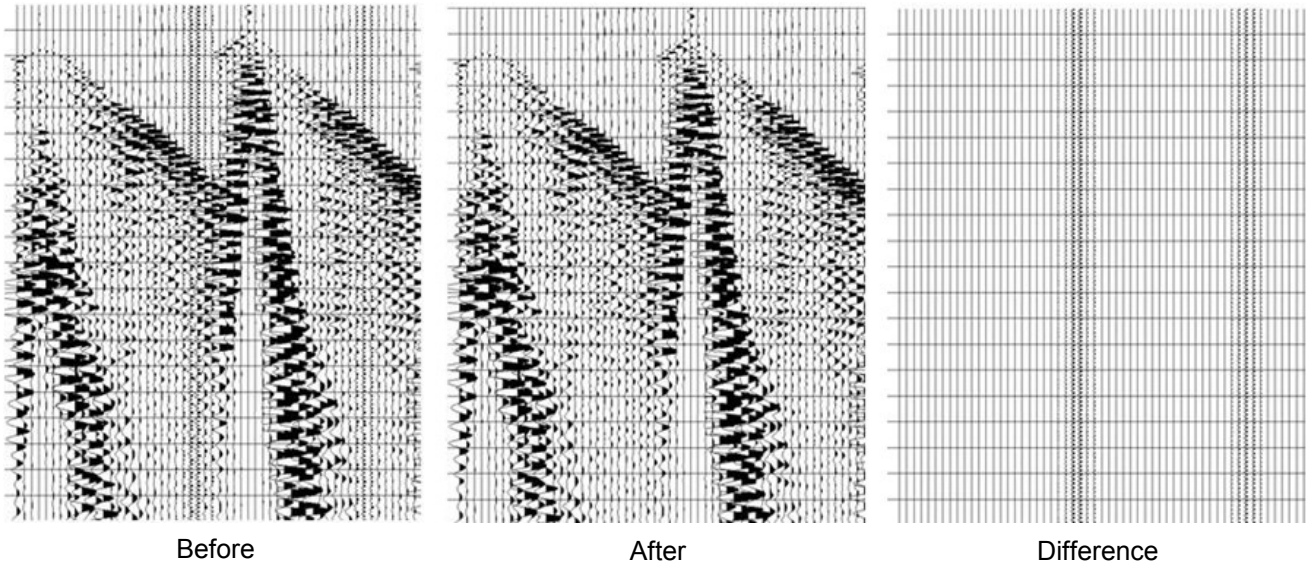
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## ***Powerline Noise Removal***



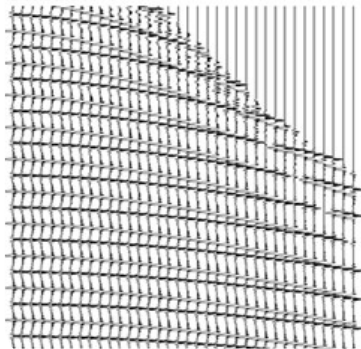
- Little or no damage done to underlying signal at the powerline frequency. No spectral notching.
- Searches for the optimal frequency over a given frequency band. The accuracy depends on trace length, but is typically within .025 Hz.
- If no significant powerline noise is found in a trace then it is left untouched. Typically only a fraction of the traces get altered. Some surveys might have no powerline noise removed.
- Harmonics of the fundamental frequency are optionally removed if they have significant amplitude. If a fundamental frequency of 59.91 Hz is detected then harmonics at 119.82 and 179.73 Hz are also searched for.
- Multiple passes can be requested. If powerline noise is removed from a trace then the altered trace is searched again for a new fundamental frequency.
- Option to output the difference (the removed noise) rather than the noise-filtered data.
- Executes quickly and parameters are few and easy to select. Parameter testing is rarely required.
- Writes a report at the end summarizing the results, including the number of traces altered and a histogram showing what powerline frequencies were found within the search band.

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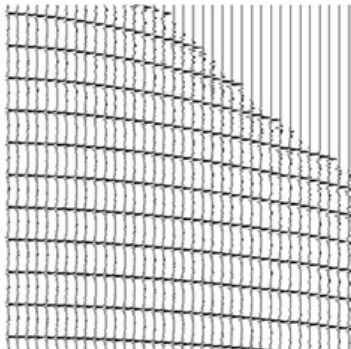
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## High-Resolution Multiple Removal

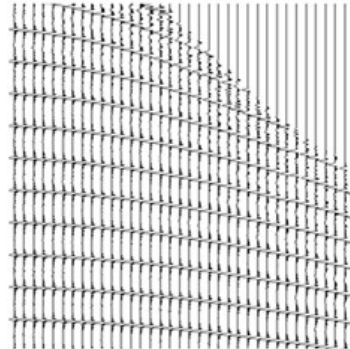
Offset →



Raw synthetic data



Demultipled data



Difference

- Removes multiples using a high-resolution time-domain Radon transform.
- Has “primary weighting”, avoiding damage to the primary energy.
- Works from non-NMOed data, avoiding distortion due to NMO stretch .
- Works in the time domain, avoiding distortion due to muted zones.
- Parameter selection is easy. No  $\tau$ - $p$  mute picking is required and executes quickly.
- Super gathers are supported.
- Can specifically target water-column multiples.
- Handles higher-order (that is, non-hyperbolic) normal-moveout curves.

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Juniper Bay Software is a Halliburton  
iEnergy partner



Software is developed in collaboration  
with Absolute Imaging Inc.