

The **Pre-Stack Pro Amplitude Analysis Toolkit (PSPRO-A)** is an add-on module that includes the tools to:

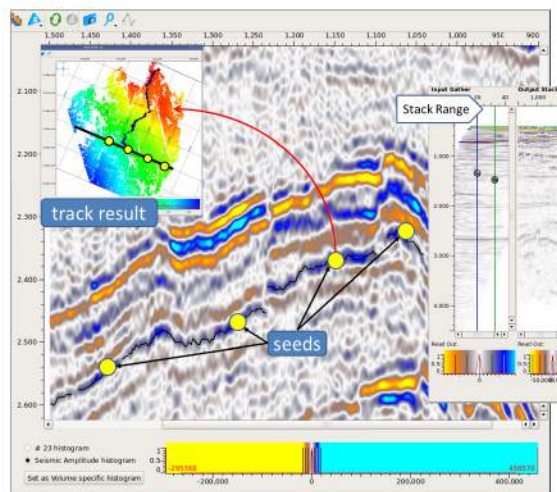
- interpret amplitude anomalies on stack data
- track horizons on pre-stack gathers
- extract and map pre-stack and post-stack amplitudes from horizons
- cross-plot any two angles and/or AVA attributes to determine fluid and lithology trends
- perform pre-stack inversion for prediction of specific lithology and fluid classes
- test processing flows on arbitrary lines, to facilitate calibration to dense well data

PSPRO-A is sold on a per-seat basis, and can be run on any number of server nodes for a flat fee. It requires the base server license.

HORIZON INTERPRETATION

Horizon Tools

The Horizon Tools module contains tools to autotrack, filter, and grid events on any stack volume, and extend the horizon picks to offset or angle gathers. All algorithms are parallelized and operate on data in memory for greater interactivity.



3D Horizon Picking

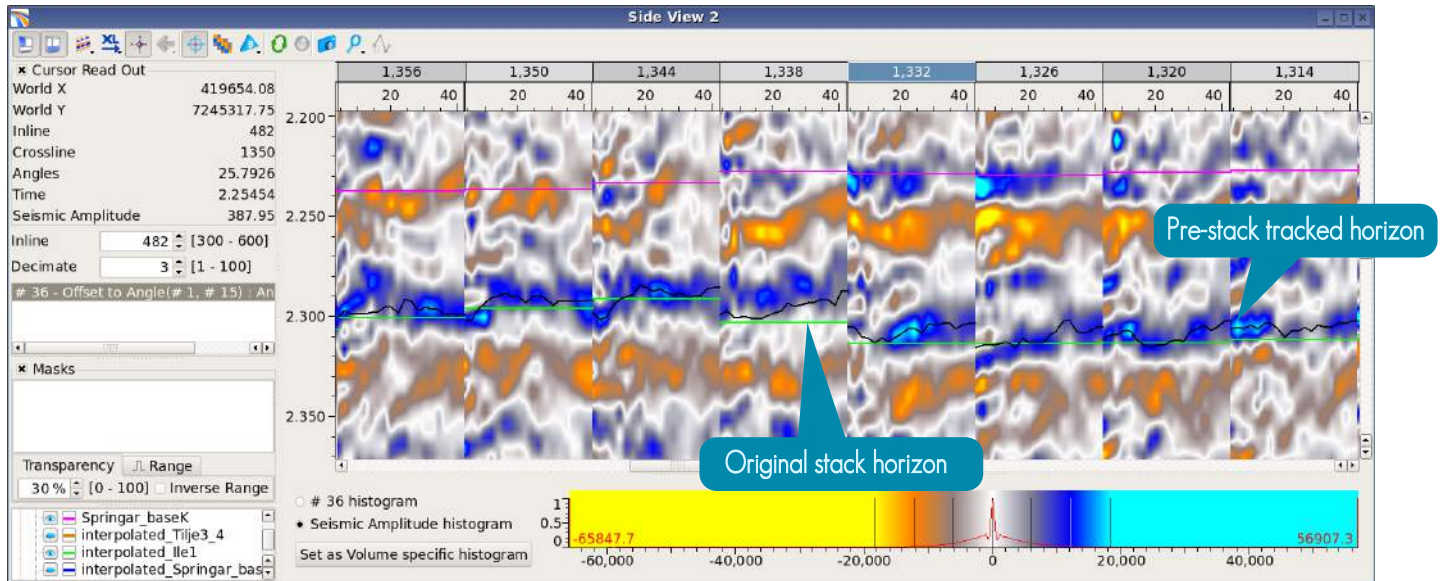
Tracking: Seed-based cross-correlation algorithm, which compares trace similarity to one or multiple seed points. Seed points are added interactively in any stacked view. Tracking may be constrained to polygons or restricted to overlying/underlying horizons.

QC and Editing: Point-and-click track-back from any picked point to its associated seed, with path automatically displayed as an arbitrary line. Editing options include parent-child deletion and map-based deletion inside "live" interactive polygons.

Filtering and Gridding: Despiking and median filtering, with or without interpolation. Three gridding methods are included (Inverse Distance Weight, Moving Average, ABOS).

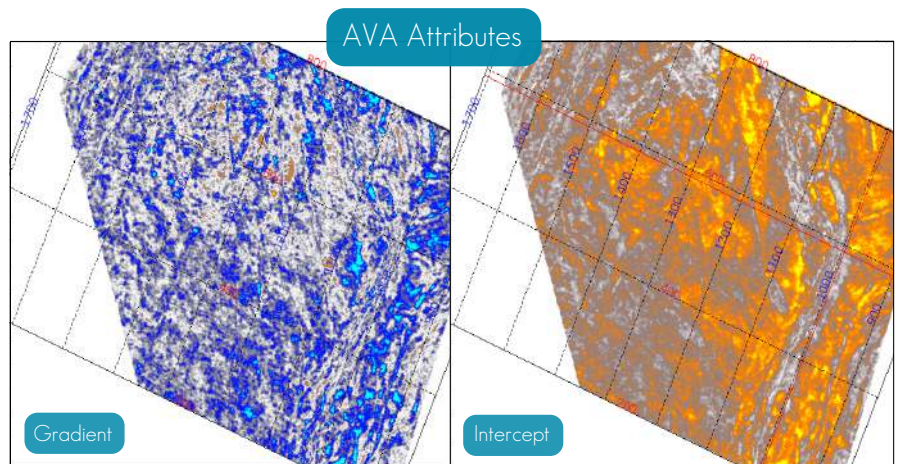
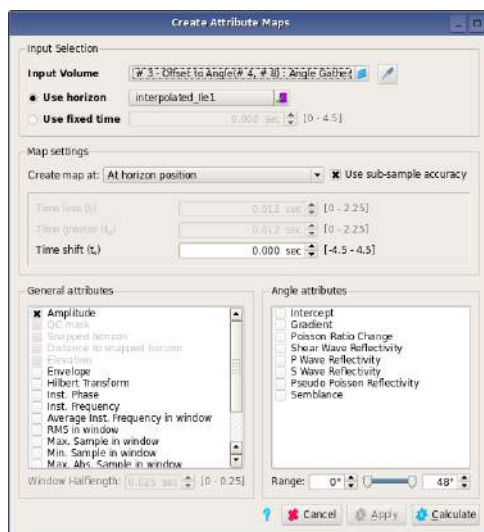
Pre-Stack Horizon Picking

Imported or auto-tracked horizons may be extended to any gather volume using snap, track, and pre-stack cross-correlation algorithms. Stacked horizons are used as seed and adjusted to the corresponding pre-stack event within a specified search window. The cross-correlation method rejects points which do not meet the track threshold, and is useful for data quality QC.



Amplitude Mapping (Create Maps)

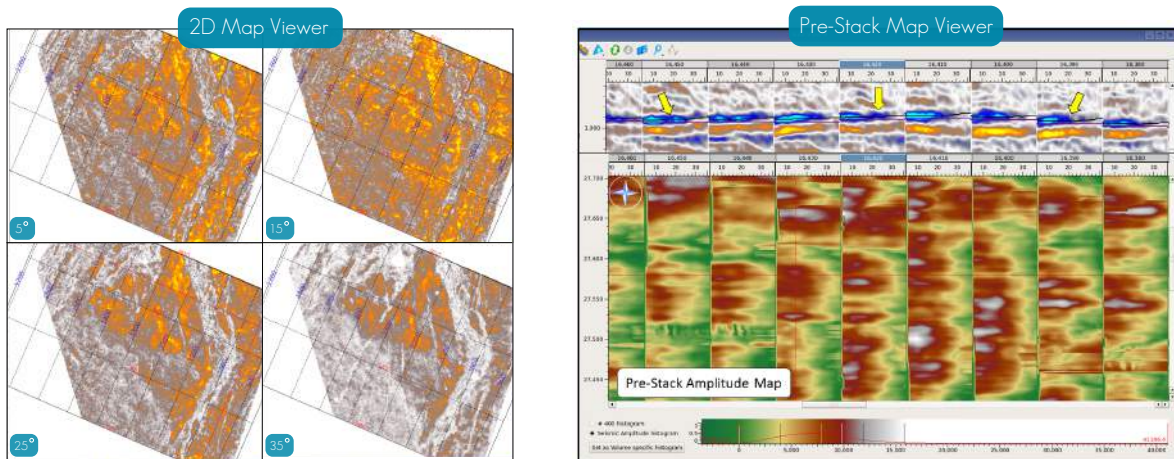
Pre-stack amplitude interpretation takes advantage of the high-fold AVO signal on gathers to improve image definition on maps. The accuracy of intercept, gradient, and other AVA attributes often improves dramatically when they are extracted on specific events, using either the "Extend to Pre-Stack" option in Horizon Tools, or by extracting statistical attributes within guided search windows.



Create Maps

The Create Maps module is a tool for creating instantaneous and windowed attribute extractions from any stacked cube or set of pre-stack gathers. Results may be displayed in the 2D Map Viewer or Pre-Stack Map Viewer. Detailed functionalities include:

- **Instantaneous attributes** (using imported, snapped, or tracked horizons). Includes amplitude, envelope, Hilbert transform, phase, and frequency.
- **Windowed attributes**. Includes RMS amplitude, mean, median, max peak, max trough, max absolute, and number of zero crossings.
- **AVA Attributes** (using imported, snapped, or tracked horizons). Includes horizon extractions of intercept, gradient, and all other AVA attributes included in the 3D AVA Attribute Calculator.

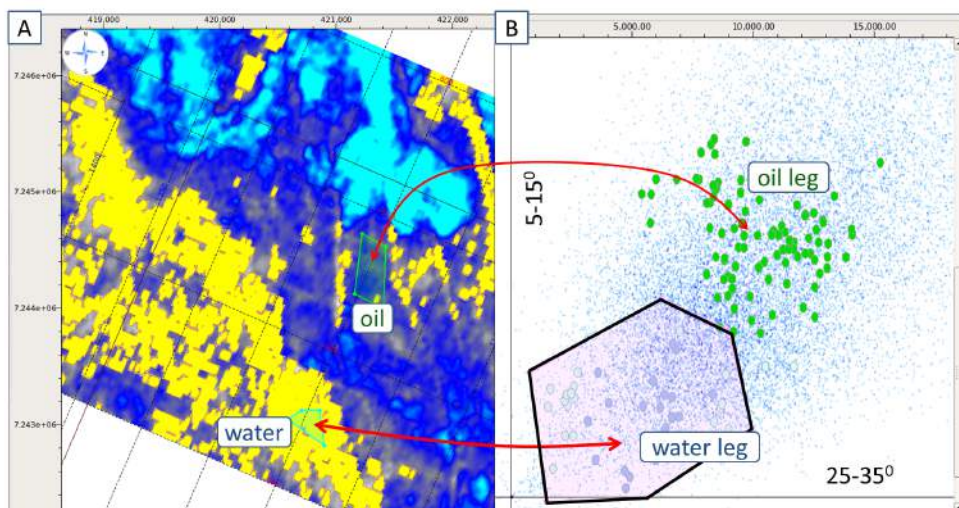


SURGICAL CROSS-PLOTS

Cross-plot

The cross-plot tool may be used to cross-plot any pair of horizon or volume attributes.

- Values are displayed as color density plots (large point sets), or scatter plots (for smaller subregions).
- Cross-plot inputs may be selected from any map, horizon attribute, or 3D volume.
- Unlimited polygon subregions may be defined in map or seismic views. Cross-plot pairs from multiple polygons can be added to a single cross-plot window, and coded by polygon color.



Masks

Polygons may be defined in any cross-plot viewer and used to generate masking functions, to identify the associated points in map and seismic viewers. Masks are updated dynamically, so changes in polygon shape or location are immediately updated in the mask.

Overlays / Attribute Projections

Trend lines and other overlays may be defined in cross-plot windows and used to generate custom attributes from linear combinations of the cross-plotted points. These are useful for delineating fluid and lithology trends in the seismic data.

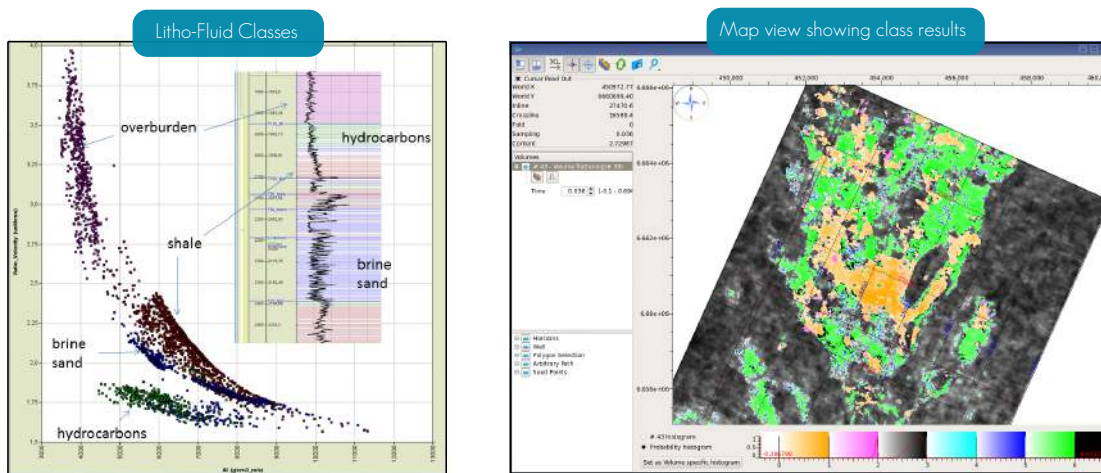
PRE-STACK INVERSION

P-Cube is a pre-stack inversion method developed by Statoil and the Norwegian University of Science and Technology (NTNU). The method computes the probabilities for different lithology-fluid classes from seismic data and geological knowledge. It combines stochastic rock physics relations between the elastic parameters and the different lithology-fluid classes, with the results from a fast Bayesian seismic simultaneous inversion from seismic data to elastic parameters.

To run P-Cube inversions in Pre-Stack Pro, users require:

- **Litho-Fluid (LF) classes** constructed from elastic rock properties measured from logs.
- **A background model** consisting of multiple zones (commonly constructed using one or more horizons), and **A-priori assumptions** about the likelihood of finding each LF class, by zone.
- Three or more **partial angle stacks**, or a set of limited-fold **angle gathers**.
- **Wavelets** extracted from each angle stack used in the inversion.

Results are output as 3D probability cubes, which predict the likelihood for each LF class in every seismic sample.



Processing on Arbitrary Paths

With the "Processing Arbitrary Paths" add-on, users can select data along any path, save and load them as discrete data volumes, and select them as input into any processing algorithm. This feature significantly reduces the memory required to view or process data through calibration points, and it simplifies process flow testing in datasets with multiple wells or complex geology.